REVIEW UNDER THE ENVIRONMENTAL ASSESSMENT ACT

prepared by Ministries and Agencies of the Province of Ontario

REVIEW OF THE ONTARIO HYDRO ENVIRONMENTAL ASSESSMENT

FOR THE

FLUE GAS DESULPHURIZATION (FGD) PROGRAM

SUBMITTED BY

Ontario Hydro

EA FILE NO. OH GE 02

Province of Ontario

REVIEW OF THE

ENVIRONMENTAL ASSESSMENT FOR THE FLUE GAS DESULPHURIZATION (FGD) PROGRAM

Submitted by

Ontario Hydro

Review Prepared
Pursuant to subsection 7(1) of the
Environmental Assessment Act

Province of Ontario

NOVEMBER, 1988

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ONTARIO HYDRO ENVIRONMENTAL ASSESSMENT FOR THE FLUE GAS DESULPHURIZATION PROGRAM

EXECUTIVE SUMMARY

The EA Branch, Ministry of the Environment, concludes the Environmental Assessment meets the requirements of subsection 5(3) of the EA Act. Provincial ministries and agencies and selected federal departments contributed to the review. They found that the required EA components were present and that the technical quality and level of detail of the information presented in the EA was satisfactory to allow a decision to be made on the acceptance or acceptance and approval of the undertaking.

However, several reviewers have indicated that further dialogue with Ontario Hydro regarding their concerns will be necessary during the project implementation stage. It is assumed that these remaining concerns and the contents of this Review will be taken into account by the Minister of the Environment or a Board, if a hearing is held, in the decision on acceptance or acceptance and approval of the proposed undertaking.

The EA Branch bases its conclusion on:

(a) the contents of the Environmental Assessment; and
(b) reviewers' comments

The Review is meant to be of assistance to the Minister, the public and interested parties as a summary of the main features of the EA in terms of subsection 5(3) requirements and reviewers' comments.

Conclusions of this Review do not represent a decision. A decision on acceptance or acceptance and approval will be made by the Minister of the Environment or a Board, if a hearing is held, after the public has had 30 days to review and comment on the EA and the Review.

PART 1 - INTRODUCTION

1.1 EXPLANATION OF TERMS

EA Act:	the Environmental Assessment Act.
EA Branch:	the Environmental Assessment Branch of MOE.
EAB:	the Environmental Assessment Board.
Environment:	as defined in clause 1(c) of the EA Act, and includes not only natural components (air, land, plant and animal life) but also social, cultural, economic, and technical components.
FGD (Flue Gas Desulphurization):	the process by which sulphur is removed from the combustion exhaust gas. For this EA and Review, it is taken to represent the equipment and facilities associated with SO_2 removal. FGD equipment is more commonly known as a scrubber. The term scrubber, when used, is to be taken as synonomous with FGD.
MOE:	the Ministry of the Environment
Net Environmental Effects:	the environmental effects (both positive and negative) that remain on balance after potential mitigation measures are added to the gross negative effects and potential enhancement measures are added to the gross positive effects of each alternative under consideration.
Proponent:	the person, agency or government ministry who carries out or proposes to carry out an undertaking, or is the owner or person having charge, management or control of an undertaking. In this case the proponent is Ontario Hydro.
PSC	pre-submission consultation.
The Act:	refers to the Environmental Assessment Act, unless otherwise specified.

The EA:	the Environmental Assessment document.
The Minister:	refers to the Minister of the Environment, unless otherwise specified.
The Public:	individual citizens, interest groups, the professional/academic community and all those who are, or perceive they are affected by the outcome of the proposal in question.
The Reviewers:	refers to the Ministries and Agencies that took part in the review of the EA.

1.2 FUNCTION OF THE REVIEW

The minister arranges for a Government Review to be prepared when an environmental assessment is submitted. The Government Review addresses the quality of the environmental assessment. It provides an evaluation from the perspective of government ministries and agencies.

Decisions Under the Environmental Assessment Act

Two decisions must be made under the Act.

- First, the Minister of the Environment must decide whether the environmental assessment is acceptable as a basis on which to make a decision on whether to approve the proposed undertaking.

- Second, the Minister, together with Cabinet, must decide whether the undertaking should be approved, approved with conditions, or rejected.

Hearings

If members of the public request a hearing the Minister will decide if a hearing is necessary. The Minister will

normally agree to such a request and refer these matters to the Environmental Assessment Board unless the Minister considers the request to be frivolous, unnecessary, or causing undue delay.

When there is a hearing, the Environmental Assessment Board or a Joint Board, constituted under the Consolidated Hearings Act, 1981, may make both decisions, or the decision on approval, if the Minister has already accepted the EA.

The Review is one input into the Minister's or the Board's decision.

Participants

The main participants in the preparation of the Government Review include:

- The Environmental Assessment Branch of the Ministry of the Environment
- The Ministry of the Environment technical staff
- Provincial Ministries and Agencies
- Selected Federal Departments and Agencies.

The Environmental Assessment Branch

The Environmental Assessment Branch coordinates the production of the Review. The Review identifies, evaluates and weighs both the strengths and weaknesses of the environmental assessment.

The Environmental Assessment Branch as a direct contributor to the Review evaluates whether the environmental assessment contains the components of an

environmental assessment which are required by subsection 5(3) of the Environmental Assessment Act. These include:

° Scope of the Environment - the range of components of the environment considered at each stage of planning, and

° Method of Analysis - the process employed to select an undertaking from the alternatives, (both alternatives to the undertaking and alternative methods of carrying out the undertaking).

Provincial Ministries and Agencies

Those ministries and agencies participating in the Review are called Reviewers. They evaluate whether the quality of the information described in the components of the EA is satisfactory.

Reviewers determine whether the data, analysis, and conclusions are sound, based on their respective mandates. Reviewers evaluate the level of detail in which the environment to be affected, the environment affects and the means of mitigation/enhancement of each alternative and their net effects were considered, as well as the environmental advantages and disadvantages of each. In addition, Reviewers assess whether they are satisfied with the range of alternatives which was investigated by the proponent. The Reviewers also advise as to whether or not they are satisfied with the weight which was given to their policy interests.

If Reviewers find significant weaknesses in the environmental assessment, they may advise on changes to

the environmental assessment and/or the need for research to obtain a satisfactory environmental assessment.

Review Conclusions

The Environmental Assessment Branch coordinates a Review for the Minister in accordance with section 7 of the EA Act. The Branch in concert with the Reviewers, uses to criteria to reach a conclusion on how ell the environmental assessment meets subsection 5(3) of the EA Act:

1. Are the components of the EA present? (scope of the environment and method of analysis).

2. Is the technical quality and level of details of these components satisfactory? Is there an appropriate range of alternatives?

If the EA Branch is satisfied that the components of an environmental assessment are present and Reviewers are satisfied with the quality of the information base, then the Branch concludes that the EA meets the requirements of subsection 5(3). If the environmental assessment is deficient in meeting either criterion, the EA Branch will conclude that the environmental assessment does not meet the requirements of subsection 5(3).

1.3 REVIEW FORMAT

Part 1 of the Review provides background information on the Environmental Assessment Act and the Review.

Part 2 of the Review provides information on the requirements of the Environmental Assessment Act.

Part 3 provides a summary description of the undertaking and the approval that is being sought. This part also contains an evaluation of whether the EA contains the required components as stipulated in subsection 5(3) of the Act. The evaluation examines the proponent's planning process, scope of the environment, method of analysis, public and agency involvement in pre-submission consultation, the range of alternatives, mitigation measures and environmental advantages and disadvantages.

Part 4 provides an evaluation on the technical quality and completeness of the information contained in the Environmental Assessment, and how well the EA addresses reviewers' policy interests.

Part 5 contains the conclusions of the Environmental Assessment Branch on how well the Environmental Assessment meets subsection 5(3) and conclusions with respect to the Environmental Assessment and the undertaking.

Part 6 contains the appendices including the review questions and the reviewers' comments on the EA.

The Review is meant to be of assistance to the Minister, the public and interested parties as a summary of the main features of the EA in terms of subsection 5(3) requirements and reviewers' comments.

Throughout this Review, reference is made to particular sections in the EA document. The Review is meant to be read in conjunction with the EA, and discussions in the Review are synopses only. Please refer to the document itself for complete discussions.

1.4 LIST OF CONTRIBUTORS

Government ministries and agencies participating in this Review, and the corresponding contact person for each, include the following:

CN Rail	Mr. R.J. Spence
Environment Canada	Mr. S. Llewellyn
GO Transit	Mr. G. Johnston
Indian and Northern Affairs Canada	Mr. R. Hatfield
Ministry of Agriculture and Food	Mr. D. Dunn
Ministry of Culture and Communications	Mr. C. Thorpe
Ministry of Colleges and Universities	Mr. E. Tannis
Ministry of Community and Social Services	Mr. P. Landry
Ministry of Correctional Services	Mr. J. Pahapill
Ministry of Education	Mr. J. Rankin
Ministry of Energy	Mr. J. Lang
Ministry of the Environment	Mr. W. Balfour
Ministry of Government Services	Mr. W. Wilson
Ministry of Housing	Mr. W. Wilson
Ministry of Industry and Trade and Technology	Mr. J. Delaney
Ministry of Labour	Dr. J. Stopps
Ministry of Municipal Affairs	Mr. R. Kennedy
Ministry of Natural Resources	Mr. L. Douglas
Ministry of Northern Development and Mines	Mr. K. Sherratt
Ministry of the Solicitor General - Office of the Fire Marshall - Ontario Provincial Police	 Mr. R. Phillipe Mr. C. Cole
Ministry of Tourism and Recreation	Ms R. Cornish

Ministry of Transportation	Mr. R. Hodgins
Ministry of Treasury and Economics	Mrs. C. Lonero
Niagara Escarpment Commission	Mr. G. Bayly
Ontario Native Affairs Directorate	Mr. M. Krasnick
Transport Canada/Airport Directorate	Mr. R. Binnie

The Coordinator of the Review and contributor for the Environmental Assessment Branch is Wes Green. For further information regarding the Review, please contact him at the Ministry of the Environment, Environmental Assessment Branch, 5th Floor, 250 Davisville Avenue, Toronto, Ontario, M4S 1H2, telephone: (416) 440-3461.

1.5 REQUIREMENT FOR ENVIRONMENTAL ASSESSMENT AND SUBMISSION FORMAT

Ontario Regulation 205/87 under the Environmental Assessment Act defines Ontario Hydro as a "public body". Public bodies are subject to the Environmental Assessment Act according to section 3 of the Act. Section 5 of the Act requires the proponent to prepare an Environmental Assessment for this undertaking.

On February 12, 1988 Ontario Hydro submitted an Environmental Assessment to the Minister of the Environment for approval under the Act. The proponent's submission consisted of a single document entitled: "Environmental Assessment - Ontario Hydro Flue Gas Desulphurization Program". A "layman's version" Summary Document is available for information purposes but is not part of the submission.

A circulation to the government review team members was undertaken by the EA Branch. Agency comments on the document and Ontario Hydro's response to them are included in Part 4 - Reviewers' Comments.

1.6 PUBLIC RECORD LOCATIONS

The Public Record for this Environmental Assessment is available for public inspection during normal business hours at:

Ministry of the Environment
Environmental Assessment Branch
250 Davisville Ave., 5th Floor
Toronto, Ontario
M4S 1H2
416-440-3461

Additional files containing the Environmental Assessment, and the Review and notices are available at the following offices:

Ministry of the Environment

London Regional Office
985 Adelaide St. South
London, Ontario
N6E 1V3
(519) 681-1011

Hamilton Regional Office
12th Floor
119 King Street West
Hamilton, Ontario
L8N 3Z9
(416) 521-7640

Halton-Peel District Office
Suite 401
1235 Trafalgar Road
Oakville, Ontario
A6H 3P1
(416) 844-5747

Sarnia District Office
Suite 109
265 North Front Street
Sarnia, Ontario
N7T 7X1
(519) 336-4030

Toronto Regional Office
4th Floor
7 Overlea Blvd.
Toronto, Ontario
M4H 1A8
(416) 424-3000

Ontario Hydro

Head Office
700 University Avenue
Toronto, Ontario
M5G 1X6
(416) 592-3318

Lambton Area Office
Wyoming, Ontario
NON 1TO
(519) 845-3371

Western Region
1075 Wellington Road
London, Ontario
N6E 1M1
(519) 681-1390

Simcoe Area Office
4 Boswell Street
Simcoe, Ontario
N3Y 4L1
(519) 426-2850

Central Region
5760 Yonge Street
Willowdale, Ontario
M2M 3T7
(416) 222-2571

Copies are also available at the offices of the clerks of the Regional Municipalities of Haldimand-Norfolk and Peel, the Corporations of the Cities of Mississauga and Nanticoke, the County of Lambton and Township of Moore.

Additional copies have also been deposited in the local public libraries in Wyoming, Courtright, Jarvis, Selkirk and Mississauga (Port Credit and Lakeview).

In addition, photocopies of the EA and this Review are available from:

RE: PRINT
517 Parliament Street
Toronto, Ontario
M4X 1P3
Telephone: 923-3374 (quote EA File Number and document name when ordering)

and microfiche copies are available from:

Legislative Offices
Check List and Catalogue Service
5th Floor
180 Bloor Street West
Toronto, Ontario
M5S 2V6
(416) 963-1995
(quote the microfiche code number when ordering)
(Microfiche code numbers are available in "EA Update")

PART 2 - ENVIRONMENTAL ASSESSMENT ACT REQUIREMENTS:

2.1 SCOPE OF THE INQUIRY

The definition of "environment" in clause 1(c) of the Environmental Assessment Act outlines the scope of the analysis required in an Environmental Assessment. The EA Branch interprets the Act to require that each aspect of the definition of environment be considered at each stage of the planning process which leads to the selection of the undertaking.

2.2 METHOD OF ANALYSIS

The Environmental Assessment documents the planning process carried out by the proponent to select an undertaking. The method of analysis to be used to select the undertaking is suggested in subsection 5(3) of the EA Act.

It consists of identifying, evaluating, comparing and as appropriate, successively eliminating alternatives, by weighing and trading off the relative net environmental effects of each, to select the preferred alternative (the undertaking), which is put forward for approval by the proponent.

2.3 LEVEL OF DETAIL

Within the context of the scope of inquiry required by the Act, the level of detail in which each aspect of the definition of environment is considered is a matter of judgment on the proponent's part. The proponent's discretion in this matter is not unrestrained. It can be challenged by any interested person, and the proponent may be called upon to explain more fully the investigation of any alternative or conclusion reached.

The level of detail may vary according to a number of factors such as the range and severity of anticipated impacts, the stage of the environmental study process of narrowing down alternatives, or the value assigned to the impacts which are considered.

Discussions on level of detail matters involving the public, government reviewers and the proponent should take place during pre-submission consultation (PSC) to allow the proponent sufficient opportunity to prepare a response to the concerns raised, or carry out additional investigation.

2.4 ALTERNATIVES TO BE CONSIDERED

The Environmental Assessment Branch's position on the identification of alternatives to be considered in the Environmental Assessment is that:

- The proponent can decide which alternatives to examine in the Environmental Assessment within the context of the requirements of the EA Act, which stipulates the "alternatives to" as well as the "alternative methods of carrying out the undertaking" must be examined.

- The proponent must identify, evaluate, compare and, as appropriate, successively eliminate both alternatives to the undertaking and alternative methods of carrying out the undertaking in selecting a preferred alternative that becomes the undertaking.

- The proponent is responsible for ensuring that the opportunity for the public and reviewers to raise alternatives is provided at a time in the proponent's planning process when decisions on and commitments to

alternatives are reversible. Both the public and the reviewers are responsible for ensuring that their suggestions for alternatives are made in a timely fashion to the proponent.

As is the case for level of detail in an environmental assessment, the proponent's selection of a range of alternatives can be challenged by any interested person, and the proponent may be asked to justify why certain alternatives were or were not examined. Discussions on the range of alternatives involving the public, government reviewers and the proponent should take place throughout PSC. Early identification in the planning process of additional alternatives to be studied gives the proponent sufficient opportunity to address concerns or carry out additional investigation prior to the formal submission of the EA.

2.5 A PROGRAM APPROACH

In September 1985, the Minister of the Environment instructed Ontario Hydro to proceed with development of an environmental assessment for the "scrubbing" component of the Acid Gas Control Program. In late 1985 and early 1986, Ontario Hydro staff met with MOE approvals staff to discuss the approach to be used for gaining EA Act approval for FGD retrofit. An individual EA approach was recommended covering a program of retrofitting selected FGD equipment at selected Ontario Hydro coal-fired generating stations.

The specific technologies and sites contained in the FGD EA would be determined by Ontario Hydro. An individual EA covering the program was recommended by MOE for the following reasons:

a) it is consistent with MOE policy to require individual EA's on waste disposal facilities (e.g., such as those which may be required for disposal of waste created by the use of scrubbers);

b) it potentially avoids delays in that there would be one EA Act hearing only, if required, to cover retrofit of 20 units.

c) it provides flexibility in that an individual EA does not necessarily need a level of technical detail that would be required for approvals under legislation like the Environmental Protection Act (EPA) or the Ontario Water Resources Act (OWRA);

d) the environmental impacts of the preferred undertaking may well be significant enough to warrant an individual EA (i.e., waste disposal);

e) the location and number of units to be retrofitted are generally known. FGD may be potentially installed on all 20 units at Lambton, Lakeview and Nanticoke; and

f) the timing of the FGD installation will be based on in-service dates required by Ontario Hydro to meet emission limits set in the regulation (i.e., the timing of the activity is generally known to be the mid to late 1990's and beyond).

EA Branch Comment

The EA Branch supports the use of a program approach as a practical and reasonable means of applying EA Act requirements to Ontario Hydro in light of the flexibility for a range of future circumstances required by the proponent.

PART 3 - ANALYSIS OF THE ENVIRONMENTAL ASSESSMENT

3.0 INTRODUCTION

Ontario Hydro's Environmental Assessment for the FGD Program involves two components:

1) The EA document itself; and

2) the Project Implementation Process to be utilized after approval of the EA.

as there are really two levels of planning involved in the EA - the present and the future. Chapters 2 to 7 of the EA deal with the present FGD activities, including discussion of the purpose and scope of the undertaking, a description and assessment of alternatives, a description of FGD processes/facilities, the environment affected, environmental effects/mitigation, and public/ government agency involvement. Chapter 8 outlines the future actions to be undertaken by Ontario Hydro in implementing individual FGD projects.

3.1 THE UNDERTAKING AND ITS PURPOSE

The Environmental Assessment Act requires that a description of the undertaking and its purpose be provided. The purpose should address the "ends" while the undertaking should provide a "means" by which to achieve the desired ends. The description of the purpose should not unduly restrict the investigation of alternatives, and should be broad enough to ensure that all reasonable courses of action are considered as alternatives.

The purpose of the undertaking is described by Ontario Hydro in Chapter 2.1 (page 2-1) of the EA, that is:

> "to reduce Ontario Hydro's sulphur dioxide (SO_2) emissions from its operating coal-fired generating stations to levels required by Regulation 281/87 under the Environmental Protection Act.

In addition, Ontario Hydro notes in the same chapter that it:

> "requires the flexibility to operate existing coal-fired stations, for a range of future circumstances, to produce electricity both economically and reliably, while still meeting the acid gas control regulation. Approval of the undertaking will make FGD available as an option in Ontario Hydro's Acid Gas Emission Control Program."

Section 5(3)(b)(i) of the Act also requires a description of the undertaking and Ontario Hydro describes the undertaking in Chapter 2.4 (page 2-5) as:

> "a program of activities associated with the retrofit of flue gas desulphurization (FGD) facilities at selected Ontario Hydro coal-fired generating stations .... Approval is requested to install FGD units, using up to four different technologies located at up to three existing coal-fired stations (i.e., Lambton, Nanticoke and Lakeview Generating Stations)."

The proponent further indicates in Chapter 2.4.1 (page 2-5) that the FGD technologies included in the EA are the following:

1) limestone slurry process
2) limestone dual alkali process
3) lime spray dryer process
4) sorbent furnace injection process

and that each of these technologies has a common set of facility components being:

1) reagent handling with processing and storage equipment
2) absorber (scrubber) vessel and associated tanks, pumps, etc.
3) waste handling facilities for processing and disposal
4) ducting and stack modifications or additions
5) offsite waste disposal

As indicated above, Ontario Hydro is requesting approval to select and install an appropriate technology at candidate stations at some time in the future from a matrix of 4 FGD technologies and 3 site locations.

3.2 IMPLEMENTATION OF THE UNDERTAKING

In order to do this, Ontario Hydro has outlined an implementation procedure in Chapter 2.4.2.1 (page 2-5) for selecting specific site and technology combinations at some point in time following the approval of the EA. This procedure involves a more detailed planning process, involving ministry, agency and public contact, and the preparation and filing of Project Implementation Reports (PIR) prior to commencing any on-site construction activities.

The PIR will outline project-specific environmental effects and proposed mitigation measures to be undertaken by Ontario Hydro and will also deal with other post-EA approvals required. A detailed description of the Project Implementation Procedure is found in Chapter 8.0 of the EA and will be discussed later in section 3.8 of this Review.

The proponent has also outlined an amending procedure for the EA that would allow the consideration of the inclusion of other FGD technologies, other station sites, or other waste disposal options to the EA. A detailed description of this amending process is found in Chapter 9.0 of the EA and will also be discussed later in section 3.9 of this Review.

Ontario Hydro has illustrated the FGD Program Planning, Implementation and Amendment Process in Figure 2.5 (page 2-7) which is reproduced in this Review as Figure A.

FIGURE A

PLANNING
FGD EA
DOCUMENT

FGD EA APPROVAL (EA ACT)
- 3 Site x 4 Technology Matrix
- Implementation Procedure
- Amendment Procedure

AMENDMENT (CHAPTER 9)
- OTHER SITE(S)
- NEW TECHNOLOGY(S)
- NEW WASTE DISPOSAL OPTION(S)

ADDENDUM TO EA
(AMENDMENT PROCESS)

SITE X TECHNOLOGY MATRIX

Technology / Site	WET LIMESTONE SLURRY	LIMESTONE DUAL ALKALI	LIME SPRAY DRYER	SORBENT FURNACE INJECTION	NEW TECHNOLOGY
LAMBTON					
NANTICOKE					
LAKEVIEW					
OTHER SITES					

Project Selection Factors
- Load Growth
- System Needs/Constraints
- Demand Management and New Supply Options
- Process Selection Studies

IMPLEMENTATION (CHAPTER 8)
(SITE X TECHNOLOGY COMBINATION)

NOTIFICATION AND CONSULTATION
PUBLIC AND GOVERNMENT

PROJECT IMPLEMENTATION REPORT (PIR)
- Permits and Licenses
- Project-Specific Environmental Effects
- Conditions of Approval
- Monitoring

NOTIFICATION AND CONSULTATION
PUBLIC AND GOVERNMENT

DESIGN, CONSTRUCTION
& OPERATION

FIGURE 2-5
FGD Program Planning, Implementation and Amendment Process

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3.3 ALTERNATIVES TO THE UNDERTAKING

Ontario Hydro discusses the alternatives to the undertaking in Chapter 3 (page 3-1) of the EA and indicates that in addition to the "Do Nothing" alternative, the proponent has considered the following alternatives to the undertaking:

1) Reducing use of coal generation;
2) Reducing sulphur content of fossil fuel;
3) Use of advanced clean coal technologies.

Ontario Hydro also notes that (including the installation of FGD equipment):

> "... Current system plans (Ontario Hydro, 1987a) propose using a combination of these options for meeting future electricity needs while staying within prescribed emission limits. Table 3-1 [reproduced as Figure B] provides a summary of how Ontario Hydro envisages making use of these various options over the next decade.
>
> The role played by each of the options will be dictated by a number of factors:
>
> a) costs;
>
> b) lead time to get option in-service (approvals plus construction/ implementation);
>
> c) technical feasibility;
>
> d) SO_2 removal efficiency;
>
> e) environmental acceptability; and
>
> f) social acceptability."

FIGURE B

TABLE 3-1
Summary of Options and their Availability for Reducing Ontario Hydro's SO_2 Emissions

	ALREADY IN PLACE	MID 1990'S	LATE 1990'S
DO NOTHING	Current measures.	Risk of breaking regulation. Less flexibility.	Significant risk of breaking regulation.
REDUCE THE USE OF COAL			
Demand Management - Market Driven Efficiency Improvements	Significant amounts already in place.	Growing effect, over 1000 MW by 1995.	Reaches 2000 MW by 2000.
- Incentive Driven Efficiency Improvements	Little effect.	By 1995, over 300 MW. Uncertainty over market participation and public acceptance.	Reaches 1000 MW by 2000.
- Load Shifting	Interruptible load 600 MW.	Direct Control and Time-of-Use rates reach over 800 MW by 1995.	Direct Control and Time-of-Use rates reach 1000 MW by 2000.
Hydroelectric Generation	Resources have been intensively developed. Provide 37 TW.h/year about one third of Ontario load.	Little Jackfish and Mattagami, 527 MW by 1995, extra 1.3 TW.h/year.	Further Niagara development 540 MW. Limited energy. Possible northern river development later.
Nuclear Generation	Over 9000 MW in service. Provides 60 to 70 TW.h/year.	Darlington over 3500 MW, extra 25 TW.h/year.	Long lead times. New Nuclear after 2000.
Non-utility Generation	Significant non-utility generation (900 MW) to supply customer's loads. Additional non-utility supply is part of BES Plan; 50 MW by 1989.	New non-utility generation 180 MW by 1995. Cogeneration small hydro and municipal waste generation are attractive options.	By 2000 over 300 MW. Could be up to 1000 MW.
Energy Storage	Peaking hydraulic stations.	Continue use and optimization of peaking hydraulic stations.	Options, being studied but unlikely to be economic.
Electricity Purchases from Manitoba and Quebec	Economy purchases around 5 to 10 TW.h. Driven by competitive energy prices.	Continue purchases around 5 TW.h. Driven by energy prices.	Price driven. Need for capacity in Quebec/ Manitoba. Interconnections required.
Reduce Exports	Economy exports around 5-10 TW.h. Driven by competitive energy prices.	High cost option. Adverse rate impacts. Contractual obligations.	High cost option.
Transmission Flexibility	A highly developed system already in place.	Improve ability to utilize nuclear energy to displace coal.	Upgrade as required/approved.
REDUCE FUEL SULPHUR CONTENT			
Coal Cleaning - Washing	Already used, moderate cost. 20% sulphur removal.	Continue use and improve if practical.	Continue use and improve if practical.
- Chemical	Not commercial.	Not expected to be commercial.	High cost. Economic benefit not established.
Lower Sulphur Coals	Already burning medium sulphur U.S. coals. Blending Western Canadian low sulphur coals at Nanticoke.	Reductions in production and transportation cost of lower sulphur coals enhance economics. Higher ash content.	Plant and fuel handling modifications required for significantly expanded use.
Natural Gas	Capacity at Hearn 1200 MW, now mothballed. Expensive fuel. Demothballing costs. Aging plant. Requires rehabilitation.	Future price uncertain. Peak supply problems likely without pipeline upgrades. Possibility of partial of full conversion of coal/oil station depends on gas prices.	New capacity unlikely before 2000. Expensive pipeline upgrades.
Low Sulphur Oil	Capacity at Lennox 2200 MW half is mothballed. Expensive fuel. Demothballing costs. Supply considerations.	Future price uncertain. Limited use for peaking duty expected.	New capacity unlikely before 2000.
ADVANCED CLEAN COAL TECHNOLOGY			
Atmospheric Fluidized Bed Combustion (AFBC)	NA	Retrofit application not economical or timely.	New capacity possible.
Integrated Gasification Combined Cycle (IGCC)	NA	Retrofit not economical or timely.	New capacity possible.
INSTALL CONTROL TECHNOLOGY			
FGD	Experimental LIF installation at Lakeview. Research and review program continuing. Seek approvals for retrofit FGD facilities.	Initiate approved retrofits as required.	Continue retrofits as required (up to 8 units by 2000).Incorporate new FGD technologies as available.

NA = Not an option in this timeframe

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3.3.1 Do Nothing

Ontario Hydro indicates in Chapter 3.1.1 (page 3-1) that, without the capability to implement FGD systems, their ability to use existing fossil-fuelled generating stations while still meeting the acid gas regulation would be severely restricted and the consequences of not having FGD available would be serious. Higher electricity costs would likely rensult as well as the possibility of interruptions in electrical service or the exceeding of the regulation limits in emergency situations.

3.3.2 Reducing Use of Coal Generation

The proponent describes various alternatives within this alternative in Chapter 3.1.2 (pages 3-1 to 3-5) including:

1) demand management (load shifting/conservation);
2) hydroelectric generation;
3) nuclear generation;
4) supplementary and non-utility generation;
5) import/purchase of electricity from Manitoba/Quebec;
6) transmission flexibility.

Ontario Hydro discusses the anticipated reduction, the timing and the constraints related to each of the above options and concludes in Chapter 3.1.5 (page 3-7) that many of the alternatives available for reducing coal use have lead times that exclude their use in the mid to late 1990's.

3.3.3 Reducing Sulphur Content of Fossil Fuels

Ontario Hydro discusses the reduction of sulphur content in fossil fuels in Chapter 3.1.3 (page 3-5 to 3-7) and

indicates that several alternatives are available including:

1) coal washing;
2) use of low sulphur coal;
3) use of natural gas;
4) use of low sulphur oil.

but that the cost of cleaner fuels and the cost of required station modifications limit this alternative (Chapter 3.1.5, page 3-9).

3.3.4 Advanced Clean Coal Technologies

The proponent discusses the advanced clean coal technology options that could be used to replace existing fossil generation and substantially reduce acid gas emissions:

1) atmospheric fluidized bed combustion (AFBC);
2) integrated coal gasification combined cycle (IGCC).

However, Ontario Hydro notes that both systems are still under development and in the demonstration stage and that it will be several years before commercial acceptability is achieved. This will preclude their use until the late 1990's or early in the next century which is considered to be too late for the critical period of 1994 - 2000 for controlling acid gas emissions.

3.3.5 Summary of Alternatives to the Undertaking

Ontario Hydro provides a summary assessment of alternatives to FGD in Chapter 3.1.5 (page 3-7). An accompanying Table 3-5 is reproduced in this Review as Figure C.

TABLE 3-5
Summary Assessment of Alternatives to FGD

DESCRIPTION	REDUCE THE USE OF COAL	REDUCE FUEL SULPHUR LEVELS	ADVANCED CLEAN COAL TECHNOLOGIES	DO NOTHING (FGD NOT AVAILABLE)
ADVANTAGES	• 100% effective in reducing SO_2 emissions when implemented and available • reduce need for FGD	• significant potential to reduce acid gas emissions (but less than 100% effective) • reduce need for FGD	• up to 95% effective in reducing SO_2 and NO_x • staged implementation possible • supply electricity as well as reduce emissions	• none
DISADVANTAGES AND CONSTRAINTS	• limited availability of some resources (e.g., hydroelectric) • long lead times for major new facilities (approvals and construction) is end of century or later in most cases • public acceptance uncertainties (e.g., demand management and nuclear) • potential adverse rate impacts (e.g., reduce exports) • use is very sensitive to cost	• fuel supply and infrastructure • limited acid gas reduction potential • cost premium for low sulphur fuels • contractual obligation for present fuel supplies • natural gas price uncertainties • equipment upgrades and improvements required • US requirements for low sulphur coal uncertain	• unproven at utility - commercial scale • uncertain operating and capital costs at commercial scale • high cost as retrofit option to existing plants	• risk of exceeding regulated emission limits • reduce flexibility to meet regulation in cost-effective manner • risk of electricity service interruption to meet regulation
CONCLUSIONS	• current plans are to reduce coal use when practical and economic • complete displacement of coal use not possible for many reasons including reliability, flexibility • cannot get significant new supply sources in place prior to year 2000	• urrent plans are to reduce sulphur levels in fuels • expanded low sulphur coal use would require station and transport infrastructure modifications • expanded use of low sulphur fuels dependent on fuel prices	• not commercially available • option for next generation of fossil-based generation • current costs are high	• unacceptable option

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FIGURE C

EA Branch Comment

Ontario Hydro has provided a reasonable and comprehensive discussion of alternatives to the undertaking, including the advantages and disadvantages of each, and a rationale for the selection of the undertaking. The consideration of the full scope of the environment is woven throughout the discussion of the alternatives to the undertaking at an appropriate level of detail.

It should be noted, however, that Ontario Hydro intends to use a combination of all of the alternatives to as well as the undertaking in its acid gas control program. The discussion of the alternatives to the undertaking is acceptable.

3.4 ALTERNATIVE METHODS OF CARRYING OUT THE UNDERTAKING

3.4.1 Introduction

Ontario Hydro discusses the "alternative methods of carrying out the undertaking" in Chapter 3.2 (page 3-9). Sections include a discussion of:

1) Generating Station Sites/Sequence of Installation;
2) Alternative FGD Technologies;
3) Waste Management.

3.4.2 Generating Station Sites/Sequence of Installation

In Chapter 3.2.1 (page 3-9), the proponent indicates that the selection of Nanticoke, Lambton and Lakeview as preferred candidate sites for FGD installation was based on several criteria including:

1) sulphur content of coal station designed to burn;
2) expected future use of station;

3) station size, remaining operating life and expected reliability.

Ontario Hydro notes that all three stations are designed to burn medium sulphur U.S. coals and that the three stations combined represent a combined capacity of 8400 MW or 93% of Ontario Hydro's total operating coal-fired generation. All three stations are major contributors to acid gas emissions in Ontario (Table 3-7) and Nanticoke and Lambton are major emitters of acid gas in northeastern North America (Table 3-8).

The proponent also indicates on page 3-9 that the sequence of application of FGD to the stations is very much dependent on future load growth (demand for electricity) as well as a number of system operating and site-specific factors.

3.4.3 Alternative FGD Technologies

Ontario Hydro indicates in Chapter 3.2.2 (page 3-11) that there are approximately 200 FGD processes existing at various stages of development, the majority of which have never progressed beyond the experimental stage. Ontario Hydro applied a screening process shown in Figure 3-2 [reproduced as Figure D] to select candidate technologies for inclusion in the EA based on the following criteria:

1) reliability, cost-effectiveness and environmental acceptability;

2) commercially proven or acceptable test results under utility conditions.

The proponent, however, addresses developing technologies as future candidate technologies by incorporating an amending procedure for their inclusion into the EA (Chapter 9.0) to be discussed in section 3.9 of this review.

FIGURE D

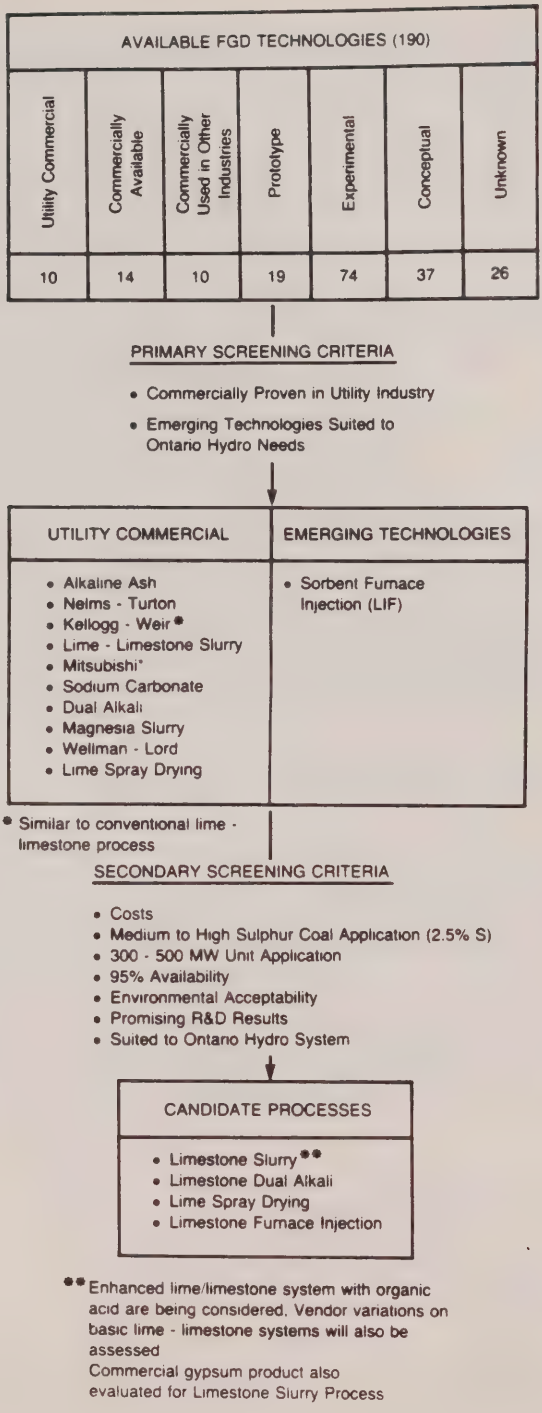

FIGURE 3-2
Candidate FGD Process Selection

Based on the screening process, Ontario Hydro has identified four FGD technologies for inclusion in the EA:

1) limestone/lime slurry process;
2) lime spray dryer;
3) limestone dual alkali;
4) limestone furnace injection.

The limestone slurry, lime spray dryer and dual alkali process all have high efficiency removal and all produce a disposable waste byproduct that can be landfilled. The proponent also indicates that, with some modifications, the limestone slurry process is capable of producing high purity gypsum suitable for wallboard manufacturing.

In Chapter 3.2.2 (pages 3-11 to 3-18), Ontario Hydro describes the candidate processes as well as several others including Nelms-Turton, Wellman-Lord, Walther-Ammonia, and then discusses the advantages and disadvantages of each process as it relates to capital costs, operating costs, construction lead time, and use of saleable product.

Detailed descriptions and discussions of each of the candidate technologies are included in Chapter 4.0 (pages 4-1 to 4-28) of the EA. Each FGD process is examined and discussed in detail under the following headings:

1) Process Chemistry;
2) Process Description;
3) Process Advantages/Disadvantages;
4) Waste Products;
5) Waste Disposal Process;
6) Waste Utilization Potential;
7) Resource Requirements;
8) Environmental Concerns.

In selecting the four candidate FGD processes for the EA, Ontario Hydro notes on page 3-15/3-18 that:

> "At this broad program level of planning, selection of a specific process for each candidate site will not be made. However, it will be demonstrated that using proper planning, implementation and mitigation procedures, any one of the candidate FGD technologies could be applied at the sites considered ... Specific decisions regarding design and application of any one of the remaining candidate FGD technologies at the various candidate sites will be made following detailed process selection studies for each site."

3.4.4 Waste Management

Ontario Hydro indicates in Section 3.2.3 (page 3-18) that all of the candidate FGD processes are essentially disposable by-product systems that produce significant quantities of non-hazardous waste. Available on-site disposal areas will not be adequate to deal with the waste produced over the term of use. The situation is critical at Lakeview where no on-site storage is available, while at Nanticoke and Lambton, some on-site storage area is available, but not enough for the estimated volumes if FGD systems are implemented.

Ontario Hydro notes that there are two ways of dealing with the anticipated waste disposal problems at the three candidate sites -- either find additional waste disposal space or find a market for the waste to reduce or eliminate the need for additional disposal areas.

The proponent discusses various waste utilization options in Chapter 3.2.3.1 (pages 3-18/3-20), including the following:

1) commercial gypsum production;
2) structural or road-base fill;
3) mine backfill;
4) hazardous waste stabilization;
5) cement additive;
6) soil additive.

and provides a summary including advantages and disadvantages in Table 3-10 which is reproduced as Figure E.

Ontario Hydro discusses waste disposal options in Chapter 3.2.3.2 (page 3-20) including:

1) use of adjacent/contiguous properties to candidate sites;
2) use of existing municipal landfill sites;
3) rehabilitation of pits or quarries;
4) development of new remote disposal sites;
5) offshore lake disposal;
6) mining and sale of aggregate under a site to provide underground disposal.

and provides a summary of the discussion in Table 3-11, which is reproduced as Figure F.

The proponent indicates in Chapter 3.2.3.3 (page 3-21) that, to ensure that the FGD system can be operated effectively, a secure and reliable way of managing the wastes produced is required and notes that:

> "At present, disposal on property contiguous to Lambton and Nanticoke appears to offer the best practical solution to long-term FDG waste management. Disposal of Lakeview wastes can be accommodated at Nanticoke on an interim basis, but a study is being conducted to find a more suitable alternative ...

FIGURE E(1)

TABLE 3-10

FGD Waste Management - Waste Utilization Options

OPTION	Commercial Wallboard Gypsum	Mine Backfill	Hazardous Waste Stabilization
DESCRIPTION	Use of synthetic FGD gypsum as substitute for natural gypsum for production of commercial wallboard	Use of FGD waste to replace cement in cement-stabilized mine backfills	Use of FGD wastes as substitute for cement in the immobilization of radiological wastes (eg. resins) and the stabilization of commercially produced hazardous liquid wastes
ADVANTAGES	• Reduces (or could eliminate) land disposal requirements • Opportunity to recover FGD costs through sale of gypsum • Year-round demand for gypsum product anticipated	• Reduces land disposal requirements • 15 years of experience exists in using fly ash for cement - stabilized backfill • Pozzolanic reactions in waste will promote hardening - particularly valuable in fluidized backfill situations	• Reduces landfill requirements for FGD wastes • Stabilized product can be landfilled • Low cost replacement for cement • Improves leachability and bearing strength of wastes
DISADVANTAGES	• Only possible with wet limestone slurry and dual alkali process • Adds 2 to 5% to costs of FGD system • Costs up to 75 times the price of land for disposal • Off-site transport costs and concerns • Process control difficulties could limit electricity output and/or render the gypsum product useless unless with respect to tight product quality control specification • Significant capital costs required by gypsum producer to make use of synthetic FGD gypsum • Ontario has abundant supplies of accessible natural gypsum	• Off-site waste transport costs and concerns - most mining operations located in Northern Ontario	• Off-site waste transport costs and concerns • Commercial application limited • No apparent commitment by hazardous waste handlers (eg. OWMC) to use FGD waste or fly ash for hazardous waste fixation purposes
CONCLUSIONS	The economics of this option are site-specific and very sensitive to transportation costs. Not likely viable for Lambton but will be looked at for Nanticoke and Lakeview during detailed process selection studies. The sensitivity of process control and the tight product quality specification will likely require backup landfill space for sub-standard gypsum to maintain FGD system reliability. Close cooperation with gypsum producer will be required.	The feasibility of this option needs to be fully assessed. Requirements to transport wastes to Northern Ontario may limit its viability at the candidate sites considered. Current negotiations are underway with mining companies regarding the implementation of a cooperative research program Application to Eastern Ontario mining operations should be investigated.	Potentially low volume user only. Initial applications with reactor resin immobilization have been promising. Further R&D required to confirm acceptability for use with commercially produced hazardous liquid wastes.

Table 3-10 continued

TABLE 3-10 (cont'd)
FGD Waste Management - Waste Utilization Options

OPTION	Road Base or Structural Fill	Soil Additive	Concrete/Cement Additive
DESCRIPTION	Use of FGD wastes for road base construction and as structural fill for utility cuts in roads	Use of FGD waste to correct elemental deficiencies, soil structure and as liming agent for acidic soils	Use of FGD waste (eg. gypsum) as an additive in manufacture of cement
ADVANTAGES	• Reduces land disposal requirements • Extensively used for road base in US • Low cost replacement for construction aggregate fill • Could be alternate aggregate source in deficient areas	• Reduces land disposal requirements • Provides selected nutrients (eg. Ca, S, Se, B) supply to deficient soil • Could act as a liming agent to neutralize soil acidity (most potential for application in Northern Ontario)	• Low cost replacement cement additive • Potential to increase structural properties of cement • Extensive experience in using dry fly ash as cement additive
DISADVANTAGES	• Off-site transport costs and concerns • Very sensitive to needs of user (eg gov't transportation planning and schedules) • Must compete with abundant available aggregate supply in Southern Ontario • Trace element leachate concerns - perception problem mainly	• Trace element plant toxicity concerns (eg boron) • An increase in soil pH may induce micro-nutrient deficiencies (eg. Zn, Mg, Fe) • Pozzolanic reactions in some wastes could impede soil drainage	Some components present in FGD wastes (eg. quick lime and calcium sulphate) could cause soundness and durability problems in concrete
CONCLUSIONS	Cannot be relied upon as a high volume user. Need to work with MTC and municipal works departments to establish a market for this waste. R&D required to better prove acceptability to this application.	Soil additives provided by FGD wastes not likely required in Southern Ontario. Transport to Northern Ontario for soil liming is cost prohibitive. Problems associated with this option rule it out as a viable use for FGD waste.	This application is unproven. Experimental work is required to evaluate conditioning and mixing procedures, soundness and durability for a range of FGD waste compositions before commercial applications can be pursued

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FIGURE F(1)

TABLE 3-11
FGD Waste Management - Waste Disposal Options

OPTION	On-Site Disposal	Disposal on Contiguous Property	Disposal at Remote
DESCRIPTION	Continued landfilling or gypsum stacking within existing site boundaries of candidate sites	Landfilling or gypsum stacking on land immediately adjacent to the candidate site	Landfilling of FGD wastes at new, remote site
ADVANTAGES	• Low cost • No off-site waste transport impacts • Maintains maximum management option flexibility (eg. wet gypsum stacking and landfilling) • No EA Act approval necessary	• Low cost • No off-site waste transport impacts • Maintains maximum management option flexibility • All waste disposal associated with generating station confined to one site	• No advantage over on-site or contiguous disposal unless these areas are unavailable and or unsuitable for waste disposal (ie. at Lakeview GS only)
DISADVANTAGES	• Little or no on-site space available at 3 candidate sites (ie. 38 ha. at Lambton GS) • Displacement of land uses on affected properties		• Off-site waste transport costs and concerns • Reduces waste management option flexibility - eliminates wet gypsum stacking • Mandatory EA Act hearing required by government policy
CONCLUSIONS	Only possible at Lambton GS Any on-site areas available for disposal will be utilized before seeking additional off-site land. Not a viable option for managing anticipated life time wastes at any of the three candidate sites	This is the preferred option at Nanticoke and Lambton GS's No adjacent land is available at Lakeview GS. Provisions have been made for storage space for Lakeview wastes at Nanticoke for an interim period until a more realistic option can be found to either use or dispose of the waste. Land around Nanticoke and Lambton is generally available for purchase and meets Hydro geotechnical requirements for a waste disposal facility	This option does not appear justified for either Nanticoke or Lambton GS's. It will be considered for Lakeview GS

Table 3-11 continued

FIGURE F(2)

TABLE 3-11 (cont'd)
FGD Waste Management - Waste Disposal Options

OPTION	Underground Aggregate Mining and Disposal	Lake Disposal	Pit & Quarry Rehabilitation	Municipal or Regional Landfill
DESCRIPTION	Mining out of aggregate underlying a candidate site and filling of mined out area with FGD waste	Direct disposal of FGD wastes into engineered offshore disposal area or manufacture of concrete-type blocks for use in offshore construction or shoreline stabilization (eg. artificial reefs , erosion control)	Use of FGD wastes to fill abandoned pits and quarries	Disposal of FGD waste in existing municipal or regional landfill areas
ADVANTAGES	• Eliminate need for surface on-land disposal • Limestone aggregate potentially useful in FGD scrubbers as reagent • Provide off-setting revenue for FGD from sale of mined aggregate to construction industry • Eliminates off-site waste transport costs and concerns • Eliminates any potential for contaminating near-surface ground water supplies	• Eliminates need for on-land disposal • FGD wastes inert, uniform fill material - concrete blocks would bind any trace elements together in-situ • Offshore areas created using concrete blocks could be used to enhance fish habitat • Potential use in lakefront reclamation projects (eg. Lake Promenade Park, Leslie Spit) • Close to markets for erosion control products	• Reduces use of productive land for waste disposal • Supports MNR policy of rehabilitating pits and quarries for viable end uses • Public at quarry sites accustomed to noise, dust and traffic disruptions • Contributes to rehabilitation	• No advantage over on-site or contiguous disposal unless these areas are unavailable and or unsuitable for waste disposal
DISADVANTAGES	• Impact and perception of large-scale mining operation (particularly in urban area like near Lakeview GS) • Off-site transport of mined aggregate • Requires several years lead-time to provide initial waste disposal space • Mining activity likely requires review and approval under EA Act • Creation of waste storage space tied to demand for aggregate likely sold at a loss • Will produce high cost aggregate	• Likely to be public and regulatory concerns about dumping waste in lakes (eg. MISA program) • Disposal area engineering and/or concrete manufacture would add high costs to FGD waste management vs landfill option • EA Act approval and hearing likely required for this option • Eliminates wet gypsum stacking as a disposal option • Long-term monitoring and quality assurance would be required • Off-site waste transport costs and concerns (if not disposed of at candidate sites)	• Eliminates wet gypsum stacking as an option • Off-site waste transport costs and concerns • Limited number and capacity of sites available • Not likely to find one quarry or pit to take life-time wastes from any one site - multiple sites required with potential multiple impacts	• Off-site transport costs and concerns • Large volumes would significantly shorten the life of municipal and regional landfills • One landfill area may not be adequate for life time wastes - multiple impacts likely • Municipal or regional councils not likely to support this concept given difficulty in securing viable disposal sites
CONCLUSIONS	Option for Lakeview GS wastes only This option appears technically feasible. Its environmental acceptability needs to be more fully assessed particularly impacts associated with operating a mining facility in a highly urbanized area. Public perception problems will likely exist.	This option appears technically feasible and environmentally sound. EPRI has demonstrated the environmental acceptability of this concept at several locations in the US Public perception difficulties associated with lake disposal of waste materials will hamper adoption of this option. R&D is needed to demonstrate acceptability in Ontario	MNR cautiously supports this concept but will require a case-by-case assessment. Acceptability will be subject to local concerns. Need to work with MNR and municipalities to develop this option (Pits & Quarries Act). This is being considered mainly for disposal of Lakeview wastes. Provincial funding may be available under proposed Aggregates Act.	This option does not appear practical for any one of the 3 sites given the other options available. Such a large volume disposal could not realistically be handled by local landfills without significantly shortening their expected life span

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> ... None of the waste utilization options appear to offer the required market potential or has enough commitment at this point in time to be relied on as a primary method for managing lifetime FGD wastes."

Ontario Hydro confirms its choice of adjacent disposal at Nanticoke and Lambton in Chapter 3.2.3.4 by outlining a methodology for alternative site evaluation involving an iterative study area screening and assessment utilizing a series of techno-economic, environmental, land use and social criteria with more detailed criteria and data being used at each successive stage of screening.

Ontario Hydro's screening process involves five (5) steps:

1) Identify a Region of Interest;
2) Identify Candidate Areas;
3) Identify Candidate Alternative Sites;
4) Evaluate Candidate Alternative Sites;
5) Compare to Preferred Site;

Detailed discussion on the screening process is found on pages 3-21 and 3-28 and Figure 3-7 [reproduced as Figure G] provides an overview of this process.

The proponent then describes the application of this process to both the Lambton and Nanticoke Generating Stations on pages 3-28 to 3-33, and, after analysis, indicates the proposed waste disposal areas in Figure 4-16 [reproduced as Figure H] (Lambton) on page 4-29 and Figure 4-17 [reproduced as Figure I] (Nanticoke) on page 4-30.

Chapter 4.3 (pages 4-28 to 4-32) provides a description of each of the candidate sites and indicates preliminary areas identified for reagent storage and processing, FGD equipment, and waste processing as well as the proposed waste disposal areas.

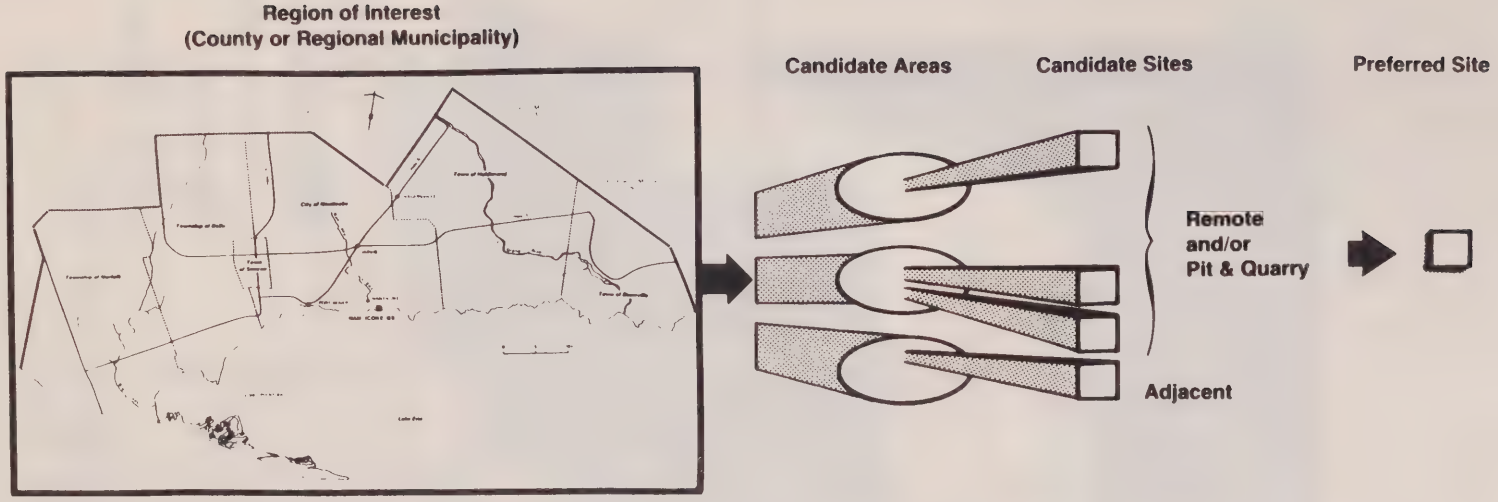

FIGURE 3-7
FGD Waste Disposal
Alternative Disposal Site Screening Process

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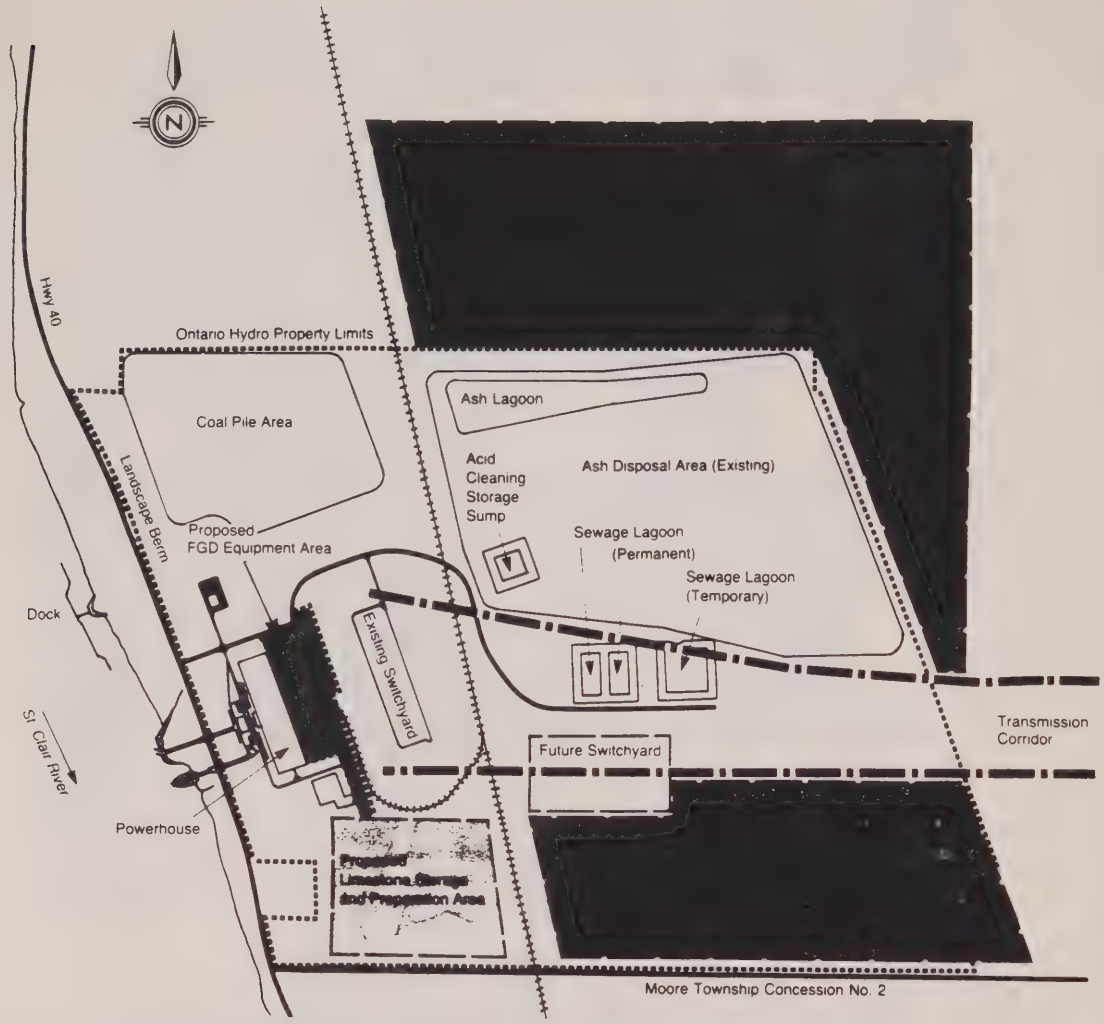
FIGURE G

FIGURE H



WASTE DISPOSAL AREA REQUIREMENTS			
Process	Area Required (hectare)	Available Area (hectare)	Tentative Areas To Be Used
Sorbent Furnace Injection (LIF)	132	133	A - B
Lime Spray Dryer (LSD)	112	111	A - ¾B
Limestone Slurry (LS)	123	122	A - ⅞B (Gypsum Stack
Limestone Dual Alkali (LSDA)	105	111	A - ¾B

Note - "Tentative Areas To Be Used" Represents
The Total Available Space

Legend

Reagent Handling and Preparation

SO_2 Removal (scrubbing)

Waste Handling and Disposal

0 100 200m

FIGURE 4-16
Lambton GS - Site Layout

FIGURE I

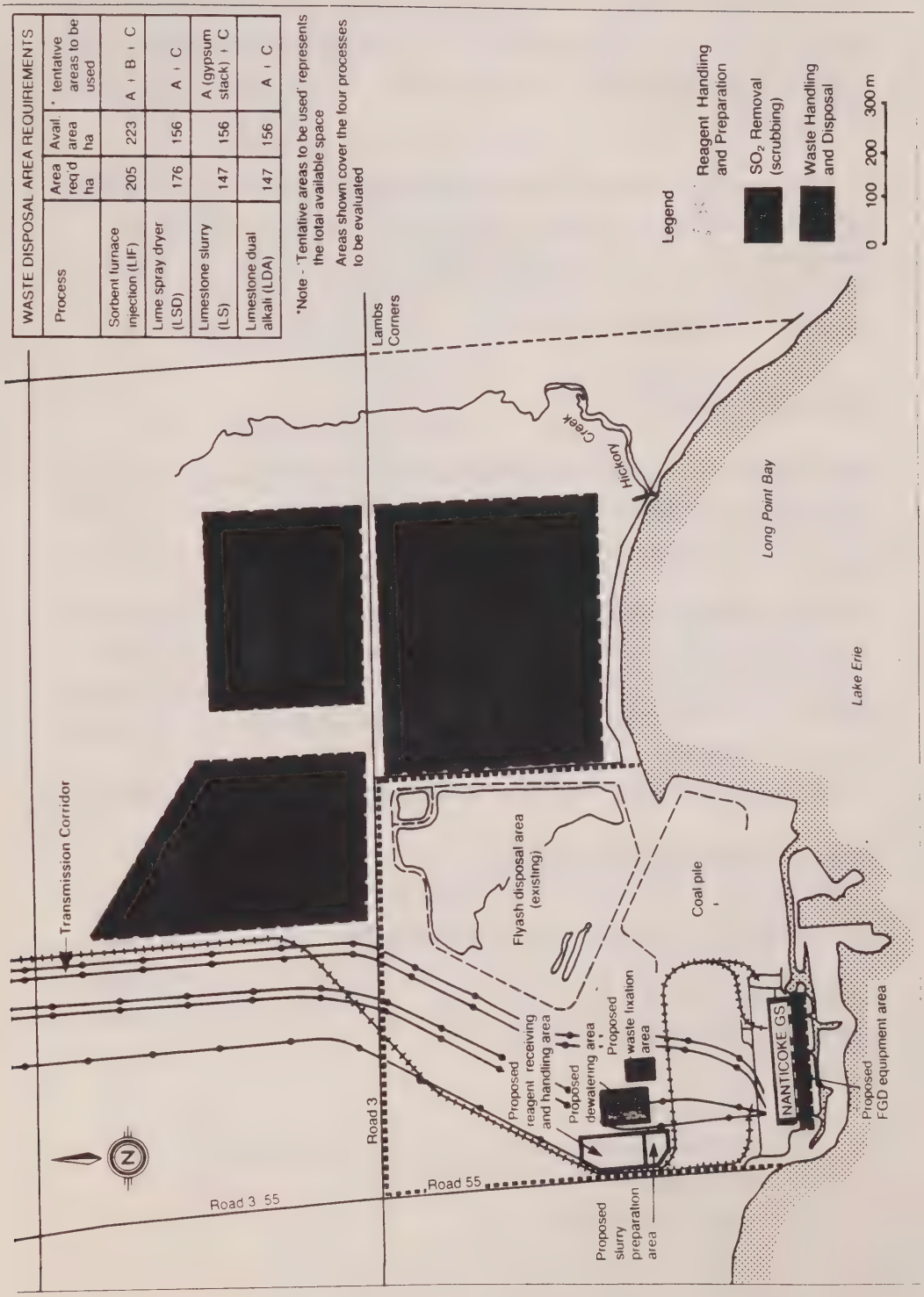


FIGURE 4-17
Nanticoke GS - Site Layout

Ontario Hydro notes on page 4-28 that detailed design and location of these facilities will be finalized during the project implementation process once a specific project is identified.

At Lambton GS, some on-site space and adjacent properties are technically suitable for waste disposal, while at Nanticoke GS some adjacent properties are suitable for waste disposal but no on-site property is available. No on-site or adjacent property is available at Lakeview GS.

EA Branch Comment

Ontario Hydro has provided a reasonable and comprehensive discussion of the alternative methods of carrying out the undertaking including a rationale of the selection of the candidate sites, a description of the various FGD technologies available and the rationale for the selection of the four (4) candidate technologies, as well as a description and rationale for the waste management aspects involved including the various waste utilization and waste disposal options. The discussion of the alternative methods of carrying out the undertaking is acceptable.

3.5 ENVIRONMENT AFFECTED

Ontario Hydro describes the environment to be affected in Chapter 5.0 (pages 5-1 to 5-36) of the EA and discusses each of the three candidate station sites and facilities under the following headings:

1) Transportation
2) Surrounding Communities and Land Use
3) Employment
4) Local Industry

5) Regional Resource Use
6) Agriculture
7) Recreation
8) Heritage
9) Atmospheric Environment
    a) Meteorology
    b) Air Quality
10) Terrestrial Environment
    a) Topography
    b) Geology
    c) Vegetation
    d) Wildlife
11) Aquatic Environment
    a) Surface Water
    b) On-site Water Management
    c) Ground Water

The Lambton GS discussion is contained in Chapter 5.1 (pages 5-1 to 5-15) while Nanticoke GS is described in Chapter 5.2 (pages 5-15 to 5-27) and Lakeview GS in Chapter 5.3 (pages 5-27 to 5-36).

EA Branch Comment

Ontario Hydro has provided a reasonable and comprehensive discussion of the environment affected for each of the candidate sites. The EA Branch considers the description and discussion of the environment affected to be acceptable.

3.6 ENVIRONMENTAL EFFECTS AND MITIGATION

Potential environmental effects and mitigation are discussed by the proponent in Chapter 6.0 (pages 6-1 to 6-48). Ontario Hydro notes that the retrofit of FGD facilities will involve potential construction and operational effects on the environment. Figure 6-1 [reproduced as Figure J] diagrams potential sources of environmental effects and mitigation measures.

Detailed discussion of generic construction phase effects and mitigation is contained in Section 6.1.1 (pages 6-1 to 6-6) while the operation phase is discussed in Section 6.1.2 (pages 6-6 to 6-20). Ontario Hydro notes that potential effects associated with the operation and maintenance of FGD equipment will result from activities occurring in four main areas:

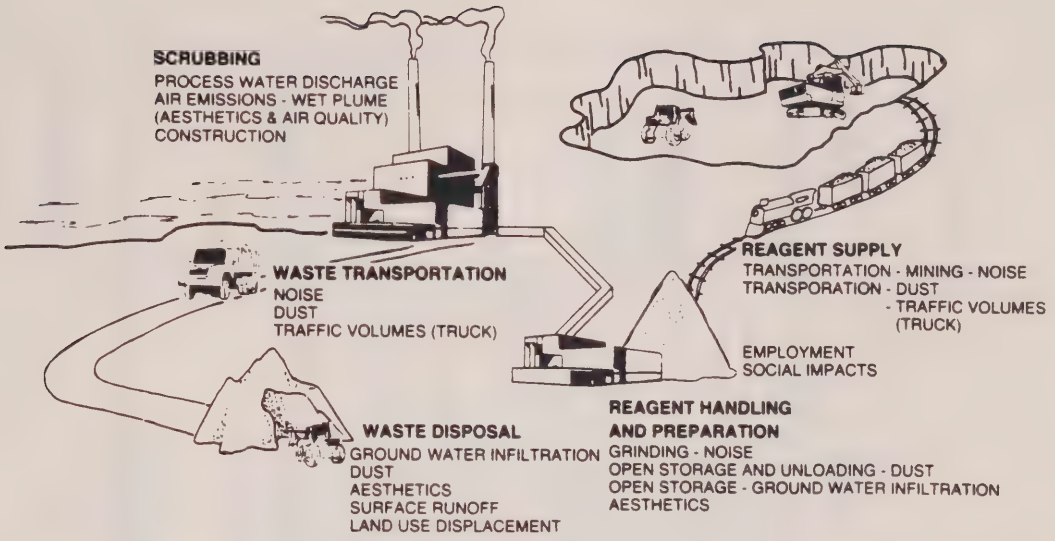
a) reagent supply, handling and preparation;
b) atmospheric emission considerations;
c) water management associated with the scrubbing process itself;
d) waste management.

Table 6-1 [reproduced as Figure K] summarizes the generic environmental effects and mitigation measures common to all candidate sites.

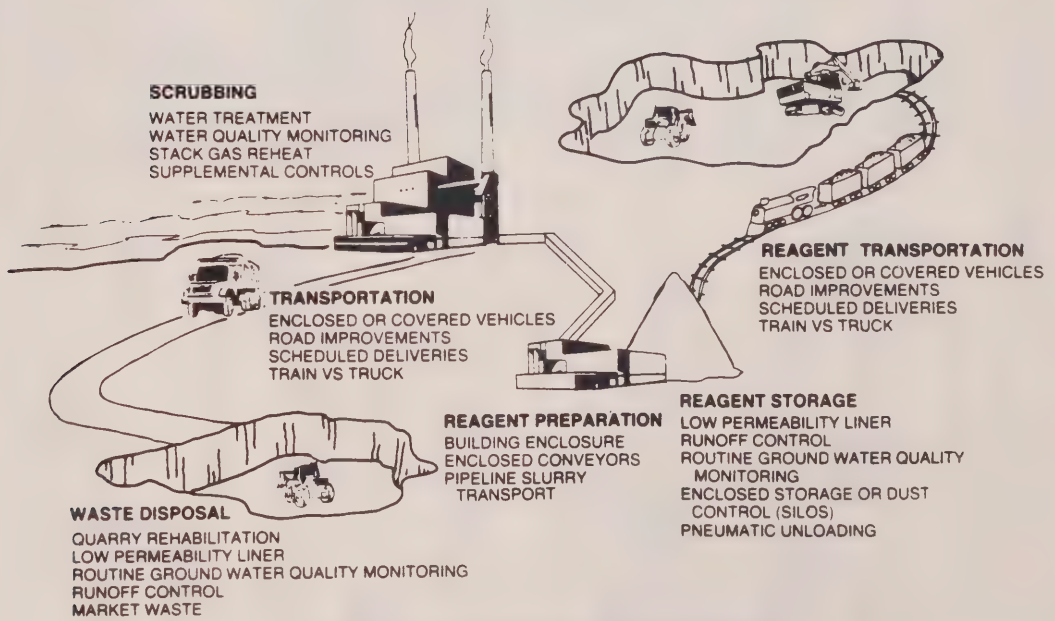
Ontario Hydro then outlines site-specific potential environmental effects and mitigation measures for the three candidate stations by discussing each one under the following headings:

A) CONSTRUCTION
   1) Air Quality
      a) Dust
      b) Noise
   2) Terrestrial Effects
   3) Water Quality

FIGURE J



(a) POTENTIAL SOURCES OF ENVIRONMENTAL EFFECTS



(b) POTENTIAL MITIGATIVE MEASURES

FIGURE 6-1
Potential Sources of Environmental Effects and Mitigation Measures Required for FGD Retrofit

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Table 6-1
FGD Program Environmental Assessment
Generic Potential Environmental Effects and Mitigation Measures

PROJECT PHASE	FACTOR	POTENTIAL ENVIRONMENTAL CONCERN	PROCESS DEPENDENCY	POTENTIAL EFFECT	POTENTIAL MITIGATION	MONITORING REQUIRED
Construction	ATMOSPHERIC EMISSIONS	Dust deposition in local community and adjacent land uses from construction activities		Loss of enjoyment of community Complaints from nearby land users	Use dust suppression measures on dirt roads, exposed surfaces Stockpile top soil and clay materials for site rehabilitation Pave heavily used roads if practical/necessary Use covered trucks to transport all particulates Implement sound construction practices to minimize environmental impacts (dust suppressants)	Measure dustfall off site
	NOISE	Noise levels on heavily travelled routes to the site and in homes near the site		Expected increase of about 5 dB in ambient noise levels	Limit working hours to daylight Pave roads where practical Pre-plan delivery routes	Noise measurements near site OH Noise Protocol to be adhered to
	AQUATIC RESOURCES	Volume and quality of on site surface runoff particularly in vicinity of new waste site(s) due to site preparation activities with vegetation clearing		Turbidity in receiving waters on or near site	Stabilize exposed slopes with vegetation Provide temporary settling ponds or use existing lagoons to reduce sediment load to receiving waters Stockpile and confine soil away from water bodies for use in site rehabilitation Dispose of fill materials in approved areas Identify sensitive areas and sites and avoid construction during periods when these activities may be affected Develop and adhere to drainage plan which is integrated with existing site drainage	Monitor water quality Inspect drainage systems Monitor outfalls
		Process water from construction activity and equipment wash and maintenance		Potential discharge of contaminants to receiving waters	Use proper refuelling practices Isolate spill susceptible operations from surface waters Proper use of disposal and waste collection containers Develop clean up procedures for spills Controlled use of toxic materials Plan for increased volumes and provide treatment of contaminated water where necessary	Monitor water quality
	TERRESTRIAL RESOURCES	Waste site clearing and preparation		Loss of agricultural land, wood lots or other adjacent land uses Increased erosion potential	Modular waste site development to minimize exposed area (site development plan) Lease back unused portions of waste areas until needed Stockpile topsoil and clay materials for site rehabilitation	
	REGIONAL RESOURCES	Population of local communities Community services	About 2 5 years shorter construction time for low efficiency process	Demand for housing and municipal facilities likely minimal since workers expected to commute from nearby communities Temporary stress on accommodation in vicinity from workers who do not commute during week	Employ local labour where practical Provide temporary accommodations if required	Monitor during construction period to detect unexpected changes
		Effects on local employment	About 2 5 years shorter construction time for low efficiency process	Average on-site work force about 200 per year peak of 700	Maximize local hiring as practical Labour Relations has determined that workers with appropriate skills are expected to be available locally or within commuting distance	
		Project expenditures		Increased local spending	None required	
		Traffic on local roads for equipment delivery and associated with construction workforce		Increased use of local roads and potential congestion and increased accident frequency	Plan access routes Schedule heavy equipment access Pave routes where necessary	Monitor during construction period

Table 6-1 continued... 04132

FIGURE K(1)

Table 6-1 (cont'd)

FGD Program Environmental Assessment
Generic Potential Environmental Effects and Mitigation Measures

PROJECT PHASE	FACTOR	POTENTIAL ENVIRONMENTAL CONCERN	PROCESS DEPENDENCY	POTENTIAL EFFECT	POTENTIAL MITIGATION	MONITORING REQUIRED
Operation	ATMOSPHERIC EMISSIONS	Wet plume	Wet process only	Increased complaints on visibility of plume Acid downwash Fogging and icing Increased frequency of air quality exceedences	Install/operate flue gas reheat where practical Burn low sulphur coal or use supplemental controls Increase flue gas exhaust temperature and velocity (reheat)	Routine air quality monitoring
		Fugitive dust emissions from reagent handling and preparation areas and waste disposal site		Dust deposition on adjacent land	Use dustless unloaders Transport materials to and from site in covered vehicles Use dust suppression measures for waste and reagent stockpile Revegetate out of service waste areas Cover conveyors Covered/enclosed reagent storage facilities (silos) Orient and contour site to prevent wind erosion Condition dry waste with water before disposal	Dustfall measurements off site
	NOISE	Operating noise near station, reagent and waste disposal areas		Increased noise level about 5-10 dB above existing noise levels	Locate reagent preparation at quarry site Operate during daylight hours Enclose equipment Install noise abatement equipment	Near site noise monitors
		Traffic noise on access routes for staff, reagent delivery and waste disposal		Approximate increase of 5-10 dB over existing noise levels	Schedule deliveries Use paved and low population access routes	
	AQUATIC RESOURCES	Process water discharge	More concern in wet scrubbing process	Increase in solids in receiving water	Use closed-loop process where possible to minimize direct release of process water Treat discharged process water as necessary	Water quality monitoring
		Water consumption	Of more concern in wet scrubbing	Requires maximum one per cent above existing station requirement per FGD unit	Use closed-loop process or process water recycle where possible to minimize make-up water requirement	Water quality monitoring
		Generation of runoff and leachate from waste disposal area	Wet gypsum stack of greatest concern Permeability of 10^{-6} cm/s	Contamination of ground or surface water Increased volume and decreased quality of surface water	Proper design and management of waste site Contour to promote surface runoff and minimize water leaching into waste Provide clay liner for disposal site where required if necessary (1 metre thick with minimum of 5×10^{-9} cm/s permeability) Modular development and progressive rehabilitation to reduce erosion potential and minimize leachate generation Provide proper drainage, collection and treatment system to control TDS in runoff (existing systems may be adequate)	Ground water quality monitoring
	TERRESTRIAL RESOURCES	Loss of existing use of adjacent land	Land required depends on process	Will depend on use and capability of property	Stockpile topsoil for site rehabilitation purposes Consider marketing opportunities or alternate uses (pit and quarry rehabilitation) to reduce longterm stacking or landfilling needs Modular development and rehabilitation of landfill Purchase and lease undeveloped property until required for waste disposal	Monitor markets for FGD waste products to identify new uses
		Changes to topography of site and surrounding area		Final landfill height site dependent Aesthetics and visibility of waste disposal site	Contour waste disposal area to blend with existing landscape at site and surrounding area Revegetate out of service areas of waste disposal	
	REGIONAL RESOURCES	Demand for municipal facilities	Required maintenance and operations staff process dependent	Existing facilities will be adequate	None required	
		Local employment opportunities	Required maintenance and operations staff process dependent	40 to 90 additional permanent employment (operations staff) opportunities for 2 high efficiency FGD units, less than 2 for LTF	None required	
		Traffic on regional roads for reagent delivery and waste disposal if off-site		Higher traffic volume Higher noise and accident potential	Schedule deliveries Plan routes on paved roads Upgrade roads as required Consider rail or barge delivery of reagent where practical	Monitor traffic conditions where necessary
		Demand for lime/limestone resources	Reagent and rate of consumption depends on selected FGD process	Increase of up 100 per cent of present production of reagent in Southern Ontario required by 2004 for lifetime use of three proposed stations	Provide adequate notification to suppliers to allow time to increase production if necessary Establish long term contracts to ensure stable supply and price	

Table 6-1 continued 04149

Table 6-1(cont'd)

FGD Program Environmental Assessment
Generic Potential Environmental Effects and Mitigation Measures

PROJECT PHASE	FACTOR	POTENTIAL ENVIRONMENTAL CONCERN	PROCESS DEPENDENCY	POTENTIAL EFFECT	POTENTIAL MITIGATION	MONITORING REQUIRED
Waste Site Rehabilitation	ATMOSPHERIC EMISSIONS	Fugitive dust	Of greater concern for dry disposal methods	Proper fixation of waste product should minimize potential dust problems	Capping and revegation of site should eliminate long-term problems Use dust suppressant until vegetative cover established	Off-site dustfall measurements
	AQUATIC RESOURCES	Leachate migration from site		Ground water contamination with high TDS levels and trace elements	Cap site with clay and contour to promote surface runoff and inhibit precipitation percolation through site Provide treatment of runoff if required	Long-term ground water monitoring
	TERRESTRIAL AND REGIONAL RESOURCES	Site re-use		Intended end use will determine rehabilitation methods Possible uses include agricultural, recreational, residential and/or commercial-industrial	Allow some time for weathering before capping and revegetation to reduce trace element plant toxicity levels (particularly boron) Amend waste with soil, fertilizer or organic matter to improve revegetation potential Complete soil cap Revegetate with grass to stabilize site and reduce erosion potential Revegetation with selected tree or vegetative cover possible in capped or soil amended site Waste material has sufficient compressive strength to support building foundations or roads	

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FIGURE K(3)

4) Socio-economic
   a) Manpower Requirements
   b) Property Concerns
   c) Zoning
   d) Taxation
   e) Transportation

B) OPERATION

1) Reagent Delivery, Handling and Preparation
   a) Dust
   b) Noise
   c) Reagent Requirements
   d) Transportation

2) Atmospheric Effects
   a) Sulphur Dioxide
   b) Nitrogen Dioxide
   c) Total Suspended Particulates From Stacks
   d) Total Suspended Particulates From Station Complex Area Sources

3) Water Management
   a) Process Water
   b) Surface Water
   c) Groundwater

4) Waste Management

The detailed discussion for Lambton GS is found in Section 6.2 (pages 6-20 to 6-30), for Nanticoke in Section 6.3 (pages 6-31 to 6-41), and for Lakeview in Section 6.4 (pages 6-42 to 6-48).

EA Branch Comment

The EA Branch considers the description and discussion of environmental effects and mitigation to be satisfactory. Potential generic effects and mitigation measures common to all candidate sites, as well as site-specific potential effects and mitigation measures for each candidate site, have been described. Commitments to provide future detailed site-specific information on environmental effects and mitigation measures at the implementation stage are contained in Chapter 8.0 of the EA.

3.7 PUBLIC AND GOVERNMENT INVOLVEMENT

3.7.1 The Public

Ontario Hydro outlines its public and government involvement component in Chapter 7.0 (pages 7-1 to 7-6) and notes that two series of public information centres were held.

The first series, held in June of 1987 near each of the three candidate sites (plus Head Office in Toronto), provided an opportunity to review information about the program, discuss the project with team members and comment on the program. The second series, held in October 1987 near the Lambton and Nanticoke sites focussed on the waste disposal aspects.

In addition, Ontario Hydro notes that municipal council presentations were made to all affected municipalities in April/May 1987, and an Interest Group Workshop was held in Toronto on June 22, 1987 for provincial groups with an interest in the acid rain issue. A planned municipal workshop was cancelled due to lack of interest.

3.7.2 Government Reviewers

The proponent also carried out Pre-submission Consultation activities in June of 1986 by notifying the standard list of government reviewers of the commencement of the FGD Program EA, and requesting their participation in the EA study. Several reviewers requested active involvement in the study and were sent an EA scope document for comment and invited to participate in regular progress meetings. However, only MOE staff of the Environmental Assessment Branch and the Environmental Approvals Branch regularly participated in the PSC process throughout 1986 and 1987.

Ontario Hydro indicates (page 7-4) that there will be future notifications and public/agency involvement during the project implementation stage for the installation of FGD units. In addition, opportunities for government and public review of any proposed amendments (i.e., adding a new technology or new site) to the EA are included in the document.

EA Branch Comment

The EA Branch recognizes the efforts of Ontario Hydro for its pre-submission consultation (PSC) activities with the government review team as well as for its information program carried out to involve the public, municipal officials and affected parties.

3.8 FGD PROGRAM IMPLEMENTATION

3.8.1 Introduction

Chapter 8.0 describes the planning process which Ontario Hydro will follow in the future (i.e., after approval of the FGD EA) when actual FGD projects are implemented.

The planning process requires that Project Implementation Reports (PIRs) be prepared and filed with the Ministry of the Environment. Ontario Hydro indicates on page 8-1 that the PIR will outline project-specific environmental effects and Ontario Hydro's commitments toward mitigation, compensation and monitoring, as well as compliance with post-EA Act approvals. Opportunities for public consultation and external notification are included in the implementation process to solicit input from government agencies, interested parties and the public.

The proponent indicates that the objectives of the implementation process are:

a) to facilitates the implementation of Ontario Hydro's FGD program, which will involve multiple projects (i.e., FGD units at three candidate sites);

b) to maintain flexibility to deal with uncertainties in system requirements, and to meet the Acid Gas Emission Regulation in a cost-effective and environmentally acceptable fashion;

c) to provide a review and approval process for project implementation so that public and government concerns, environmental effects, mitigation means, and monitoring requirements are adequately considered; and

d) to reduce the in-service lead time for these FGD projects while ensuring that they are carried out in compliance with the commitments made in the FGD EA and with post-EA Act approval requirements.

3.8.2 The Project Implementation Process

A flowchart of Ontario Hydro's Project Implementation Process is shown in Figure 8-1 [reproduced as Figure L] and consists of 2 phases:

1) Project Documentation and Approval;
2) Project Implementation

3.8.2.1 Phase I - Project Documentation and Approval

Ontario Hydro indicates that it will select a project for implementation based on the following factors:

a) future load growth;

b) acid gas emission requirements;

c) system needs, such as meeting load requirements, performance of nuclear and hydraulic generation facilities;

e) effectiveness of demand management (e.g., conservation measures, reduction in peak demands);

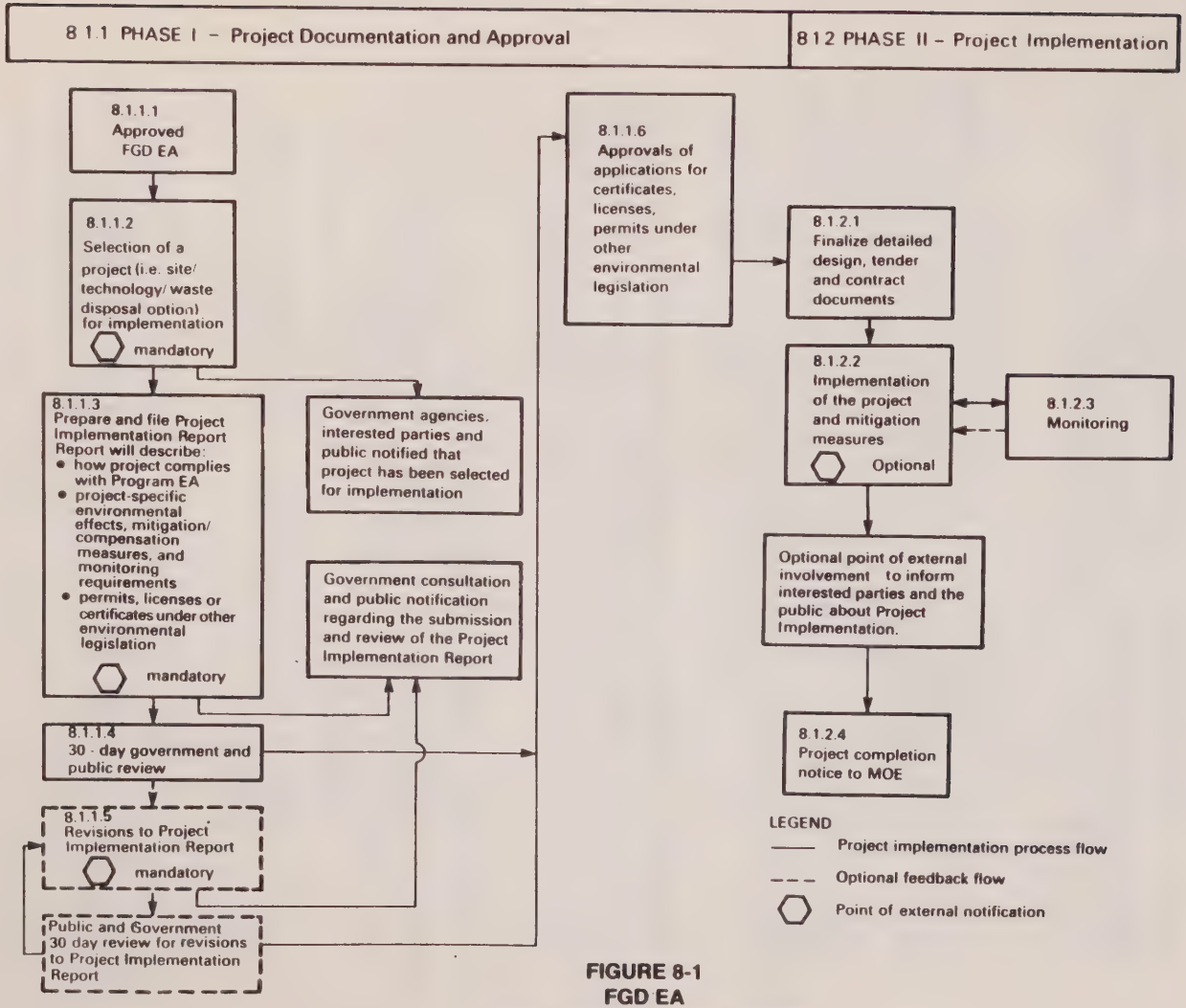

FIGURE 8-1
FGD EA
Project Implementation Process

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f) process selection studies (discussed in Section 4.5) to identify the FGD process which is commercially proven, reliable, cost-effective, and environmentally acceptable; and

g) environmental advantages and disadvantages.

and that once a decision is made to proceed, site-specific studies will be initiated to obtain detailed information and to assess project-specific environmental impacts and mitigation measures required.

At this point, Ontario Hydro would issue the First Notice to government agencies, interest groups and the public and invite agency involvement and public input. Pre-submission consultation will be carried out prior to submission of the Project Implementation Report and the proponent indicates that, upon request, working groups would be formed to provide input to the preparation and review of the PIR.

The types of mechanisms and approaches for informing and involving the public will vary with each project and the group involved. A typical information and involvement plan would involve several of the following activities:

1) open houses/information centers;
2) notification in regional/local newspapers;
3) municipal and/or provincial presentations;
4) interest group/community association presentations;
5) direct individual contact with property owners immediately adjacent to or displaced by a project.

Ontario Hydro will then prepare the PIR and file it with the Director of the Environmental Assessment Branch of MOE. Contents for each PIR will include the following sections:

a) Introduction
b) Purpose of Project
c) Project Description
d) Project Compliance with FGD EA and Post-EA Act Requirements
e) Project-Specific Environmental Effects, Mitigation/Compensation Measures and Monitoring;
f) External Interests in the Project - Public and Government Involvement

A Second Notice will be given at this point to notify government review agencies, interested parties and the public that the PIR has been completed and filed. Copies of the PIR will be provided to review agencies and interested parties and will also be made available for public review at local municipal offices, regional offices of Ontario Hydro, MOE Regional and District Offices and the EA Branch of MOE.

A public review period of 30 calendar days from the date of receipt by EA Branch will be standard and, if no objections are received, Ontario Hydro will proceed with the project.

If objections or concerns are received, Ontario Hydro will attempt to resolve them through discussion and negotiation. However, if these concerns cannot be resolved, the matter will be referred to the Minister of the Environment for resolution and a decision.

If concerns raised can be resolved, revisions to the PIR may be required. If so, a revised PIR will be filed with the EA Branch and a mandatory Third Notice given to the public, review agencies and affected parties. Copies of the revised PIR will be given to all parties that received the initial PIR and a further 30-day review period will be allowed. Any issues arising during the review period will be referred to the Minister of the Environment for a decision.

The final step of Phase I involves application by Ontario Hydro for certificates, permits and licences required by other environmental legislation.

3.8.2.2 Phase II - Project Implementation

Project implementation involves the following activities:

1) Finalize detailed design, tender and contract documents;
2) Implement project and mitigation measures;
3) Monitoring.

which are discussed on page 8-4. When a project is completed, Ontario Hydro will send a Project Completion Notice to both the Director of EA Branch and the appropriate Regional Director(s) of MOE.

The proponent has also included an amendment procedure for making minor adjustments to the Project Implementation Process in Section 8.2 (page 8-5).

EA Branch Comment

The EA Branch is satisfied that the implementation process described and Ontario Hydro's commitment to it, satisfies the EA Act requirements for future projects to be carried out in accordance with the approved EA.

However, the EA Branch suggests that Figure 8-1/Project Implementation Process be revised to better reflect the public and government consultation provisions for production of the Project Implementation Report.

By letter of August 17, 1988, Ontario Hydro has indicated that revisions to Figure 8-1 will be made in consultation with the EA Branch to ensure that the process is clearly explained.

3.9 AMENDMENTS TO THE ENVIRONMENTAL ASSESSMENT

Ontario Hydro describes an amendment process in Chapter 9.0 to be followed in the future to:

a) incorporate new FGD technologies, as identified through the process selection studies (discussed in Section 4.1), and associated waste disposal options;

b) include new candidate Ontario Hydro fossil-fuelled generating station sites (i.e., other than the three sites defined in the EA); and

c) incorporate new disposal options associated with the four FGD technologies identified in the FGD EA, such as new waste disposal locations or different methods of disposal.

The amendment process is shown in Figure 9-1 [reproduced as Figure M] and includes at least two (2) mandatory points of public/agency notification as well as an opportunity to request a "bump-up" of the requested amendment(s) to individual EA status.

EA Branch Comment

The amendment process, including the provision for "bump-up" is acceptable to the EA Branch.

FIGURE M

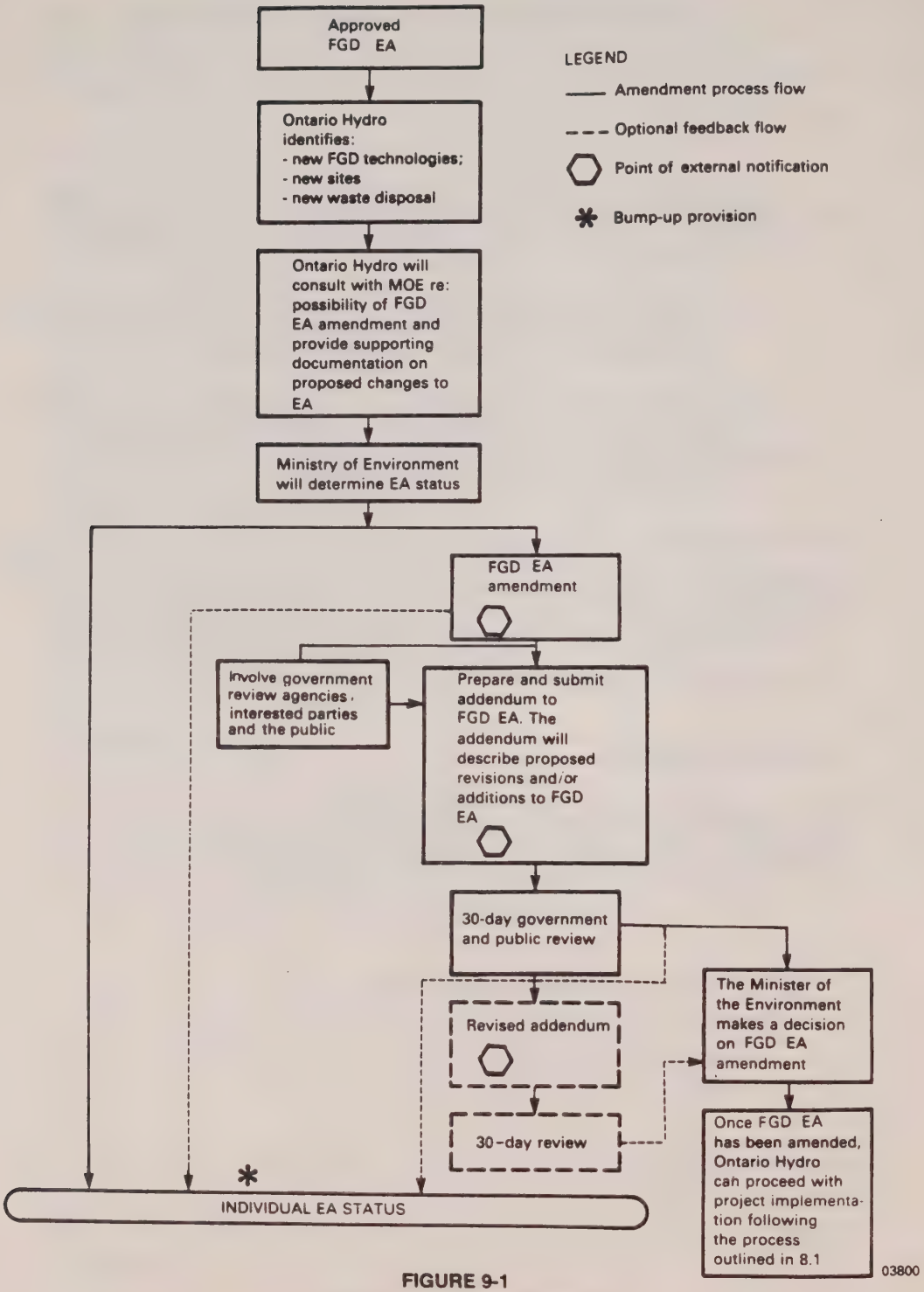

FIGURE 9-1
FGD EA Amendment Process

3.10 CONCLUSIONS ON FIRST CRITERION: EA COMPONENTS

The Environmental Assessment Act requires that an EA contain specified components, (S.5(3)) considered in light of the definition of the environment provided in S.1(c).

In the case of the FGD EA, since approval is being given for projects which will be implemented after approval of the EA, the document must provide discussions of all the factors and components required by the EA Act, and it must indicate how the requirements of the Act will be addressed for future individual projects.

The EA contains the required description of purpose, and the required description and rationale for the undertaking, the alternatives to the undertaking and the alternative methods of carrying out the undertaking.

The definition of environment in the Act has been considered by Ontario Hydro in evaluating alternatives to the undertaking and alternative methods described in the FGD EA, and is provided for in evaluating alternative methods at the project implementation stage.

The proponent has, in the EA, provided a general description and discussion of the environment affected, potential environmental effects and mitigation measures, and alternative methods of carrying out the undertaking.

The proponent has also addressed alternatives to the undertaking in the EA, and will not consider them further at the project implementation stage. In view of the nature of the undertaking and the flexibility required by the proponent to deal with a wide range of growth scenarios, this approach is acceptable.

In the discussion and analysis of the alternatives to the undertaking, the proponent has considered, at a broad level of detail, the environment affected and generic environmental effects and mitigation, the advantages and disadvantages for the undertaking and the alternatives to the undertaking and has provided a rationale for each. On this basis, the EA Branch is satisfied that Ontario Hydro's evaluation of alternatives to the undertaking meets the requirements of the Act.

The proponent's project implementation process contained in the EA for the future implementation of individual projects, provides for a more detailed consideration and evaluation of the alternative methods of carrying out the undertaking, the environment affected, the potential environmental effects and the mitigation measures and the advantages and disadvantages associated with them. The planning process also incorporates a detailed public and agency consultation process.

The amendment process contained in the EA for the addition of another FGD technology or another site is subject to a "bump-up" provision to the status of an individual EA.

On the basis of the above, the EA Branch concludes that the components of an environmental assessment, as required by the Act, have been included in the FGD EA document and have been provided for in the project implementation process to be applied to future projects.

PART 4 - REVIEWER'S COMMENTS

4.0 INTRODUCTION

The Government Review is meant to address the quality of the Environmental Assessment by providing a balanced evaluation. While the Environmental Assessment Branch evaluates whether the required components are contained in the Environmental Assessment, the ministries and agencies participating in the review evaluate the technical quality and completeness and the level of detail of the information describing the components of the Environmental Assessment as well as providing comments on the range of alternatives studied.

The Environmental Assessment for the Ontario Hydro Flue Gas Desulphurization Program (February 1988) was circulated to the various ministries and agencies of the government review team.

Reviewers were asked to provide an evaluation based on their mandate of:

- The technical quality and completeness of the EA which includes the soundness of the data, analysis and conclusions in the Environmental Assessment as well as an evaluation of the appropriateness of the level of detail of this information and the range of alternatives studied.

- How well the Environmental Assessment addressed the policy interests of each review Ministry or agency.

A number of reviewers have provided extensive comments on the EA. Only the conclusions of their review, however, and the headings of the matters addressed in their comments, are highlighted in this section of the Review.

The full text of the comments provided by reviewers, which were considered in reaching the conclusions on the EA and the undertaking in Part 5 of this review, is contained in Appendix A of this Review.

The complete text of Ontario Hydro responses to agency comments is contained in Appendix B of this Review.

4.1 COMMENTS - FURTHER ACTION REQUIRED

MINISTRY OF AGRICULTURE AND FOOD

The Ministry of Agriculture and Food expressed a major concern regarding the commitment for future activities contained in the document, including the commitment to accept landfilling as the preferred waste management option. The Ministry also noted that the EA established no specific criteria for the eventual selection of specific projects at any of the three generating stations.

The Ministry had no objection to the Lambton landfill proposal provided the lands proposed were not designated agriculture in the official plan but were concerned with the Nanticoke proposal for which some of the proposed landfill areas are currently under an agricultural designation.

Ontario Hydro Response to Concerns

Ontario Hydro met with MAF officials on May 28, 1988 and then confirmed their discussions by letter of July 14, 1988. It was noted that, although landfill was required as a fall back contingency, Ontario Hydro would commit to use non-agricultural land in the initial waste disposal, and develop any necessary portion on agricultural land last. It was also noted that Ministry would have the opportunity to review the detailed proposals for each site at the Project Implementation Phase.

MINISTRY OF ENVIRONMENT

The Approvals Branch coordinated a review by appropriate Regions and Branches of MOE (with the exception of EA Branch) and provided extensive comments noting there were several significant concerns.

Major areas of concern included the following:

- Policy
- Technology
- Land Use
- Waste Disposal
- Air Emission
- Wastewater

Ontario Hydro Response to Concerns

Ontario Hydro met with MOE officials on several occasions (May 25/June 15/June 23/July 20) to review the concerns expressed and provided supplementary information (see Appendix B) at MOE's request.

Based on the supplementary information supplied, the Ministry of the Environment still has a major concern regarding both alternative and candidate technologies for secondary air quality effects, particularly fugitive emissions of particulate matter.

However, MOE has recommended approval of the EA, subject to conditions being attached (see October 4, 1988 letter). The proposed conditions will be considered at the Notice of Acceptance and Approval stage of the EA.

It should be noted that MOE will be consulted during the Project Implementation Stage.

ENVIRONMENT CANADA

Environment Canada offered substantial comments on the EA including the following:

- Scope
- Purpose
- Consultation
- Commitment to Mitigation Measures
- Consistency with Environment Canada Codes of Practice for Steam Electric Power Generation
- By-Product Utilization
- Flue Gas Preheat
- Continuous Emission Monitoring
- Nitrogen Oxides and Trace Contaminants
- Fugitive Dust

The major concern of Environment Canada was the lack of specific and unqualified commitment by Ontario Hydro in the document to appropriate mitigation measures for the long-term program. Specifically, Environment Canada noted that environmental concerns could be reduced or eliminated by:

1) having the FGD program consistent with Environment Canada's Environmental Codes of Practice for Steam Electric Power Generation;

2) giving appropriate weight to environmental factors, and credible economic, commercial and technical factors, when considering FGD by-product gypsum utilization;

3) providing flue gas re-heat in wet FGD systems;

4) providing continuous stack emission monitors;

5) anticipating future water and air quality requirements in long-term planning;

6) providing detail and commitment to fugitive dust control.

Ontario Hydro Response to Concerns

Ontario Hydro met with Environment Canada officials on June 8, 1988 to discuss the concerns involved and detailed minutes are contained on Appendix B. Actions required to resolve these concerns have been agreed on as outlined in the minutes of that meeting and Environment Canada will be consulted during the Project Implementation Phase.

4.2 COMMENTS - NO FURTHER ACTION REQUIRED

MINISTRY OF CORRECTIONAL SERVICES

This Ministry concluded that the project would not impact on its mandate, policies and/or operations.

MINISTRY OF CULTURE AND COMMUNICATIONS

The Ministry noted that it supported any undertaking that would reduce the effect of acid rain on the environment but indicated that any undertaking that changes minimally undisturbed grade has the potential to disturb archaeological deposits.

The Ministry requested that, prior to any expansion onto any properties for the purpose of new facility construction, Ontario Hydro carry out a heritage resource assessment, including an evaluation of potential impact and avoidance or mitigation of impact.

Ontario Hydro Response to Concerns

In a letter dated August 16, 1988, Ontario Hydro acknowledged MCC's comments and confirmed its commitment to conduct heritage investigations in consultation with MCC during the Project Implementation Phase.

MINISTRY OF EDUCATION

The Ministry wished to ensure that local school boards were being advised and consulted and supplied a list of the six boards involved.

Ontario Hydro Response to Concerns

In a letter dated August 16, 1988, Ontario Hydro noted that during the Project Implementation Phase, all the school boards specified would be notified.

MINISTRY OF ENERGY

The Ministry noted that Ontario Hydro's FGD program was generally satisfactory but that there was a need for a more thorough review of the options available at the project implementation stage.

Ontario Hydro Response to Concerns

In a letter dated August 18, 1988, Ontario Hydro acknowledged the concerns expressed, noting that detailed discussion of the options for meeting the province's electricity requirements are contained in the Demand/Supply Option Study, and that the need for scrubbers will be reviewed annually. In addition, it was noted that the Ministry would be invited to participate in the Project Implementation Process, leading to installation of FGD at each of the generating stations.

MINISTRY OF GOVERNMENT SERVICES

This Ministry noted that no assets or interests would be affected by the FGD EA, but the implementation of the

program, including waste site operation, could have adverse impact on MGS titled property. However, the Ministry also noted that it will have the opportunity to review detailed design of committed projects through the Project Implementation Process outlined in the EA.

MINISTRY OF MUNICIPAL AFFAIRS

The Ministry concluded that its policies and programs were not adversely affected and were satisfied that Ontario Hydro had met its obligation under the Planning Act to consult with affected municipalities. The Ministry was also satisfied that Ontario Hydro had considered the impact of the undertaking in light of municipal planning policies and land uses surrounding the three generating stations and, accordingly, had no objection to the acceptance of the EA document and the approval of the undertaking.

MINISTRY OF TOURISM AND RECREATION

The Ministry commented that tourism and recreational concerns had been adequately covered.

CN RAIL

The agency noted, that although not reviewed in detail, the EA appeared to be thorough and satisfactory.

GO TRANSIT

GO Transit noted that an overview of the document did not reveal any concerns relating to general compliance with legislation and regulations, public information process or the overall approach to the examination of alternatives.

NIAGARA ESCARPMENT COMMISSION

The Niagara Escarpment Commission found the document complete, appropriately detailed and adequate and did not foresee any conflicts with its plans or programme.

ONTARIO NATIVE AFFAIRS DIRECTORATE

The Directorate noted that there are several reserves located within commuting distance of the Lambton and Nanticoke generating stations, and requested Ontario Hydro contact the Chiefs and Band Councils to determine the potential labour force available for developing an employment equity program for Native people.

Ontario Hydro Response to Concerns

In a letter dated August 26, 1988, Ontario Hydro indicated that construction workers will be union members provided by local trade unions and that Native people registered with the union would have an opportunity to work on the projects. In addition, commitments were made to negotiate greater local employment opportunities with the union, where possible, to discuss apprenticeship opportunities for Native people, and to encourage local business and Indian Bands to bid on service and supply contracts. Ontario Hydro also noted that the Indian Bands would be invited to participate in the Project Implementation Process.

TRANSPORT CANADA - AIRPORTS AUTHORITY GROUP

The Airports Authority Group noted that it was Transport Canada's responsibility to assess individual structures to determine if they constitute a hazard to air navigation, thus requiring marking and/or lighting and that the

development of any new stacks at Nanticoke, Lambton and Lakeview sites must conform to Transport Canada standards.

Ontario Hydro Response to Concerns

In a letter dated May 16, 1988, Ontario Hydro indicated that if, any new stacks are required, compliance with the Aeronautics Act will be incorporated at the time of stack design.

4.3 NO COMMENTS OR CONCERNS

The following Ministries and agencies stated no concerns with the undertaking:

- Ministry of Community and Social Services
- Ministry of Housing
- Ministry of Industry, Trade and Technology
- Ministry of Northern Development and Mines
- Ministry of the Solicitor General
    - Office of the Fire Marshall
    - Ontario Provincial Police
- Ministry of Transportation
- Ministry of Treasury and Economics
- Indian and Northern Affairs Canada

4.4 CONCLUSIONS ON SECOND CRITERION: COMPONENT QUALITY AND COMPLETENESS

Reviewers have provided an evaluation of the technical quality and level of detail of the information provided in the EA, the appropriateness of the range of alternatives considered, and an evaluation of the weight the proponent has given to the policy interests of their particular Ministry or agency during the course of planning.

Many reviewers have indicated that the EA is satisfactory. However, several reviewers have identified the need for further action or dialogue which will take place during the project implementation stage of the undertaking.

The Ministry of the Environment has recommended approval of the EA subject to suggested conditions of approval.

Based on the reviewers' comments regarding the technical quality and level of detail of the components of the EA and the range of alternatives considered, it is concluded that the second criterion for meeting subsection 5(3) of the Environmental Assessment Act has been met.

PART 5 - CONCLUSIONS ON THE ENVIRONMENTAL ASSESSMENT AND THE UNDERTAKING

5.1 THE ENVIRONMENTAL ASSESSMENT

The Review presents an evaluation of the EA from the standpoint of the following two criteria:

1. Are the components of an EA present? (scope of inquiry and method of analysis); and

2. Is the technical quality and level of detail of these components satisfactory and is there an appropriate range of alternatives?

With respect to the Environmental Assessment for the Ontario Hydro Flue Gas Desulphurization Program, the EA Branch is satisfied that the components of an EA are present and/or have been provided for in the project implementation process outlined in the EA.

Reviewers have provided an evaluation of the technical quality and completeness of the information presented in the EA, and the appropriateness of the range of alternatives considered. As discussed in Part 4 of the Review, several reviewers have indicated concerns with the completeness and/or quality of the documentation of certain matters in the EA.

Efforts by Ontario Hydro to resolve these concerns during the review period were partially successful (see Appendix B). It is assumed that any residual concerns and the contents of this Review will be taken into account by the Minister of the Environment or a Board, if a hearing is held, in the decision on acceptance or acceptance and approval of the proposed undertaking.

Based on the evaluation of the Environmental Assessment for the Ontario Hydro Flue Gas Desulphurization Program, the Environmental Assessment Branch has concluded that the components of an EA required by the Environmental Assessment Act are present and/or have been provided for in the project implementation process contained in the EA, and the technical quality and level of detail of these components is sufficient to satisfy the review agencies subject to conditions of approval. As such, the EA Branch concludes that the EA meets the requirements of subsection 5(3) of the Act.

Following the publication of this Review, there is an opportunity for the proponent to discuss with review ministries and agencies the matters which they have raised in their comments on this Environmental Assessment, and to the extent possible, to resolve these matters prior to the commencement of a hearing (if required) or the implementation of specific FGD projects.

APPENDIX A

REVIEW QUESTIONS AND REVIEWERS' COMMENTS

Ministry of the Environment
Ministère de l'Environnement
Ontario

135 St. Clair Avenue West
Suite 100
Toronto, Ontario
M4V 1P5

135, avenue St. Clair ouest
Bureau 100
Toronto (Ontario)
M4V 1P5

323-4550

February 12, 1988

MEMORANDUM

TO: Distribution List #1
Government Review Team

FROM: Wes Green
Review Coordinator
Environmental Assessment Branch

RE: ONTARIO HYDRO - ENVIRONMENTAL ASSESSMENT
FLUE GAS DESULPHURIZATION (FGD) PROGRAM
EA FILE NO. OH-GE-02

Enclosed is the above-noted Environmental Assessment (EA), which has been submitted to the Minister of the Environment for approval.

Would you please complete the enclosed "Acknowledgement of Receipt" form and return it to me immediately for our records.

The EA Act requires that a Review of the EA be prepared. The Review is designed to evaluate the EA based on the strengths as well as the weaknesses of the EA. When significant weaknesses are identified, reviewers should indicate what changes are required and/or what research is needed to obtain a satisfactory EA document.

To contribute to the Review of this EA, each reviewer is asked to carry out an evaluation by responding to the questions which are found in Attachment 1 of this letter.

In addition, to assist in the preparation of the Review, each reviewer should provide a summary statement of their position on the EA and the undertaking.

Please provide your comments to me by April 1, 1988. As we have allowed 48 days for comments, I regret that we will be unable to grant any extensions to the above date as this EA is on a very tight schedule.

If you have any questions, or if I can assist you in the review process, please call me at 323-4550.

Wes Green

Enclosure

WG/jm

ATTACHMENT #1

The questions listed below are designed to obtain advice from reviewers on the quality of the environmental assessment and if necessary, how to improve it.

The Ministry of the Environment Review Coordinator evaluates whether the EA contains all the components of subsection 5(3) of the EA Act. Answers to questions 1 through 4 address the analysis of the technical quality and completeness of those components. If an EA contains the proper components and reviewers are satisfied with their quality and completeness, the Review Coordinator will conclude that the EA meets the requirements of subsection 5(3) of the Act. If the EA is deficient in meeting either criterion, the EA Branch will conclude that the EA does not meet the requirements of subsection 5(3).

Question 5 aims to ensure that actions necessary to meet reviewers' requirements are specified in the EA and will be carried out to the reviewer's satisfaction.

Question 6 provides advice on how well the undertaking addresses the policy interests of a particular Ministry. Question 7 provides information on the roles reviewers played during pre-submission consultation as well as the quality of the consultation process.

Please address the following questions in your evaluation of the EA from the perspective of your Ministry's or agency's mandate. If strengths or weaknesses are identified, please indicate their significance. If weaknesses are significant, please indicate what changes and/or research is required to obtain a satisfactory EA document.

1. Are the data, analyses and conclusions in the EA satisfactory, i.e., are these relevant and substantiated?

   - Does the information in the EA cover all relevant issues at an appropriate level of detail?
   - Are you satisfied with the methods and techniques described in the EA to predict environmental effects and any mitigation measures necessary to reduce those effects?
   - Is the analysis logical and easy to follow?

2. Do you feel that the proponent has chosen an appropriate range of alternatives to investigate in the EA?

3. Are the monitoring and contingency plans specified by the proponent in the EA adequate?

4. Is the way in which the proponent intends to implement the undertaking satisfactory?

   ° Does the undertaking comply with your Ministry's or agency's legislative requirements?

5. Has the proponent clearly indicated how compliance reporting regarding commitments in the EA related to your mandate will be fulfilled?

6. Are you satisfied with the importance, relative to other aspects of the environment, given to your interests in the selection of the undertaking?

   ° Is the undertaking satisfactory to you? If not, which alternative(s) do you prefer and why?

7. What role did your agency play during pre-submission consultation, e.g., a technical resource, a member of a working group, a reviewer?

   ° Are you satisfied with the way in which your advice at that stage of the EA process was taken into consideration by the proponent in the preparation of the EA?

In preparing your overall evaluation, please take account of the following considerations:

   ° **Reasons, with substantiation, should be given for any conclusions.**

   ° **Adequate consideration should be given to all alternatives, not just the recommended one(s).**

To assist in the preparation of the Review, please provide a summary statement of your position on the EA and the undertaking.

The questions above are not meant to restrict the scope of the review. Please provide any additional comments from the perspective of your mandate which you feel are important to this evaluation.

ONTARIO HYDRO - ENVIRONMENTAL ASSESSMENT
FLUE GAS DESULPHURIZATION (FGD) PROGRAM
DISTRIBUTION LIST #1 GOVERNMENT REVIEWERS

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Foodland Preservation Branch

(416) 965-9433

March 31, 1988

Mr. Brain Ward
Director
Environmental Assessment Branch
Ministry of the Environment
135 St. Clair Avenue West
TORONTO, Ontario
M4V 1P5

Dear Mr. Ward:

RE: Environmental Assessment
Ontario Hydro
Flue Gas Desulphurization (FGD) Program
EA File No.: OH-GE-02

We have received for review the above noted final EA document. We have conducted our review within the mandate given to us by the Food Land Guidelines. These comments are in line with comments we have previously sent to Ontario Hydro on the draft EA.

Our major concern with this EA is the commitment for future activities made by the approval of this EA in its present form. Should this EA be approved, it appears to us that Ontario Hydro can chose relatively freely from among the four candidate FGD technologies to implement FGD at any of the three GSs discussed in this EA. Furthermore this EA commits us to accept landfilling as the preferred waste management option. This commitment is being sought without complete investigation of the waste management options that exist.

This EA which sets out the options for FGD, including waste management, establishes no specific criteria for the eventual selection by Ontario Hydro of specific projects at any of the three GSs. Without specific criteria being established in this EA, it becomes difficult in the future to raise concerns during the consultative process outlined in Chapter 8 about a specific technology proposed in a Project Implementation Report.

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With respect to the Lambton GS site, we have no objection to the landfill proposal, based on our mandate to protect agricultural lands for the long term, provided that we receive reassurance from Ontario Hydro that the lands proposed for landfilling are not designated agriculture in the official plan for the area. We do, however, have concerns about the principle of landfilling given the incomplete study of waste management in this EA.

With respect to the Nanticoke GS site, we have concerns about the use of lands currently designated as Agriculture for landfilling purposes. Given the incomplete study of waste management options and the occurence of other industrially designated lands in the area, we are not convinced of the necessity of using these lands for landfilling.

Attached to this letter are comments which form the basis for our concerns and provide detail on the above concerns.

If you have any questions, please contact Tonu Tosine, Regional Manager (Southwestern, Central and Northern Ontario) of this Branch

Yours very truly

for/ Donald Dunn
Director

att.

TT:tt
h:fgdea.tt

REVIEW COMMENTS
ONTARIO MINISTRY OF AGRICULTURE AND FOOD

RE: Environmental Assessment
Ontario Hydro
Flue Gas Desulphurization (FGD) Program
EA File No.: OH-GE-02

Chapter 2, The Undertaking

The EA identifies the components of the FGD facilities in section 2.4.1. The interest of this Ministry is principally with regards to two components: (c) waste handling, processing and disposal facilities, and (e) off-site waste disposal and associated property acquisition at two of the candidate generating stations. This is not to say we have no interest in the other components, as their selection does have subsequent impact on the two components identified above. We, however, do not provide specific comments on the technologies associated with the other components.

Section 2.4.2 states that this EA seeks approval to select and install appropriate FGD technology at candidate stations according to procedures set out in this EA. To us, this means that what is approved in this EA will in fact occur in the future at these sites. We are concerned that this EA "locks" us in to commitments, for which the alternatives have not been fully evaluated. We note our specific concerns below.

Chapter 3, Alternatives

Section 3.2.2 outlines the alternative technologies for FGD. Our interest in this section stems from a desire to reduce the requirements for landfilling wastes generated by FGD. We note that the EA refers to costs associated with the different technologies.

Our concern is that rather than having determined the full implications of the alternatives and related costs, this EA concludes by saying that more work will be done in the future. For example we read: "...Ontario Hydro plans to prepare a detailed evaluation of the economics of producing wallboard gypsum at each of the candidate sites..."; "Ontario Hydro's FGD process selection studies will evaluate the economics of limestone slurry/wallboard gypsum option." Yet we are being committed by this EA to a process that ends up with landfilling of wastes on sites presented in this EA without a complete study of the alternatives.

Also on the issue of comparative costs, the EA does not indicate what impact each of the FGD technologies (including waste management) will have on total Ontario Hydro generation costs (and subsequently individual consumer's costs). It is not possible to comment on the relative costs to consumers (eg. electric power charges) and the relative benefits to society (eg. no landfilling) that the different technologies present.

Section 3.2.2 concludes by stating that specific design decisions regarding the FGD technologies will be made following detailed process selection sudies. Other than mention topics to be considered in the selection process, no specific criteria are established for actually evaluating and selecting a FGD technology to be installed. We are concerned that any one of the four FGD technologies is permitted and it will be by and large up to Ontario Hydro to make the choice on its own.

We note that Figure 3-3 indicates existing and projected FGD systems in the United States. No similar situation report is presented for other countries such as Germany and Japan, in which Ontario Hydro reports that "land availability problems (for landfilling) are more acute." Ontario's agricultural land base is similarly quite limited and already faces competition for other urban uses. We cannot but wonder how such countries are able to follow FGD alternatives which do not result in landfilling.

Section 3.2.3.1 presents the waste utilization options. We inherently support such options. We particularly note that "In Japan and Europe (West Germany), where there are restraints on widespread throwaway practices for disposal of power plant wastes, the utility companies have adapted to their circumstances; they have been broadly successful in operation of by-product type FGD processes." We wonder if Ontario is not moving in this direction given the four R's of waste management being promoted widely and Ontario Hydro's co-operation, for example, in using waste energy from the Bruce Nuclear GS for steam heating adjacent development. There is no committment in this EA by Ontario Hydro to emphasize waste utilization options when it considers specific facilities to be built.

Section 3.2.3.2 presents waste disposal options. We note that Ontario Hydro supports landfilling on lands adjacent to Lambton GS and Nanticoke GS. The principal reason Ontario Hydro gives for making this choice is to "...minimize costly and environmentally objectionable transportation of waste..." We question this environmental impact conclusion when we read elsewhere that the reagent delivery requirements will add between 1 per cent (Lakeview GS) and less than 5 per cent (Lambton GS) to transportation movement on area roadways. We wonder whether waste generation and its transportation would increase traffic any more

significantly 1/ . No specific information is provided.

Also we wonder about the costs of transportation of waste. We read that an option is to "co-transport" waste and reagent in the same vehicles. This option has not been fully considered. If this EA is approved, it does not appear that this option will necessarily be considered by Ontario Hydro, as approval is being given by this EA to landfill on adjacent lands.

We take exception to the statement in section 3.2.3.2 that "None of the disposal options considered offers any significant advantage over the perferred alternative of using contiguous properties at Nanticoke or Lambton." Yet, for example, there would appear to be benefits associated with waste disposal at quarry sites: in addition to facilitating redevelopment of a "hole" by filling it up with waste, this option avoids using agriculturally designated lands, as well as industrially designated lands for landfilling -- the afteruse of which is uncertain.

Section 3.2.3.4 describes the site selection process for landfilling. The selection of candidate areas and sites (ie. steps 1, 2 and 3) did not consider any agricultural criteria. While built-up areas and "dedicated lands" were excluded from consideration, agriculturally designated, suitable and/or used lands were not. We are also concerned that Ontario Hydro established a 20 km criterion in step 3. Such a criterion apparently excludes the possibility of backhauling to a limestone quarry which may be providing reagent.

It is only in step 4, candidate site evaluation, that agriculture is mentioned. It seems that step 4 is a data collection/descriptive step, with no criteria established.

We note in the description of step 5-Lambton GS that this Ministry's concern about landfilling is acknowledged. We disagree with the response on page 3-28 by Ontario Hydro to our concern: "Limiting waste disposal to only industrial areas restricts siting to a narrow band along the St. Clair River." An examination of Figure 5-2 indicates an extensive industrial designation in Moore Township, extending further east than the Lambton GS present site.

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From Table 4-1 we were able to compare reagent requirements and waste generation. For example, for wet limestone slurry FGD, 61,000 tonnes of limestone result in the generation of 75,000 cubic meters of waste (excluding fly and bottom ash). Density of the waste is in the range of 0.360 tonnes to 1.362 tonnes per cubic meter for dry and wet material respectively.

We would like reassurance that the lands which Ontario Hydro has selected as part of the landfill site to the north-east of the Lambton GS do not include any of the lands presently designated as agricultural.

With respect to step 5-Nanticoke GS, it is not evident that land designated Agriculture was to be avoided in the evaluation process. Large areas near Nanticoke GS are designated as either Heavy Industrial or Industrial. We would have no objection to the use of these lands for landfilling . The Nanticoke Industrial Influence Area, to our understanding, is intended to restrict new development (eg. residential) that is not compatible with industrial uses. There is no commitment in the official plan policies that the NIIA is to be developed for uses other than agriculture; that is to say, landfilling is not a permitted use nor an intended eventual use on agriculturally designated lands because of the NIIA identification.

Chapter 4, FGD Processes and Facilities

This chapter describes the details of the FGD processes and facilities. We note that the emphasis on waste management continues to be landfilling. Other options for waste management are said to require additional research. The reader is referred to other sections dealing more particularly with waste management and site rehabilitation.

Section 4.3 describes the site facilities for each GS: Lambton, Nanticoke and Lakeview. For Lambton and Nanticoke GSs, landfill sites are shown.

Chapter 5, Existing Environment

In describing the existing environment at each GS, we note in particular the area land uses shown on Figures 5-3, and 5-12 for Lambton GS and Nanticoke GS respectively.

In the text, we read for Lambton GS that in Moore Township 64 per cent of the land designated for industrial purposes is not currently used for industrial purposes. This supports our view that land designated for agriculture should not be used for landfill purposes.

A similar statement regarding the industrial designations in the City of Nanticoke for the Nanticoke GS area is not presented in the EA. The EA does, however, acknowledge that there are at least 1000 hectares in the Lake Erie Industrial Park yet to be developed to the west of Nanticoke GS.

Chapter 6, Environmental Effects

In this section, we note the environmental impacts originating from the Operation and Waste Site Rehabilitation phases of the project. These have been summarized in Table 6-1. Our concerns relate to loss of existing use of adjacent land, changes to topography of site and surrounding area, and site re-use. In particular our concern is that the mitigating measures (eg. market opportunities or alternative uses) are not necessarily required measures, but rather are matters that may be considered (and possibly discarded) if specific and rigorous criteria are not established in the EA whereby technologies and mitigating measures are to be evaluated and implemented.

We note in section 6.1.2.1 the discussion of reagent supply. The EA notes that the expansion of existing, and development of new, sources may be required to guarantee reagent supply in the 1990s and that early notice may be required to be given to potential suppliers/producers. Of interest to us is the notion that future suppliers may have to be encouraged/developed for reagents and yet in the discussion of waste re-use, options for re-use are discounted because of the present absence of guaranteed users of waste (eg. see section 3.2.3.3).

In Table 6.8 we note that waste volumes range from 309,000 cubic meters to 10,300,000 cubic meters per year depending on process used, GS and year of operation. We support those technologies which reduce the amount of wastes, generate wastes that can be re-used and/or do not require landfilling on adjacent lands when other options such as disposal in quarries exist.

Section 6.1.2.3 purports to deal with the environmental impacts of waste management. This section, however, deals only with the landfill option. It does not discuss the environmental impacts of other waste management options described in Chapter 3.

The emphasis on landfilling is disconcerting given that other waste management options have not been fully evaluated yet.

Section 6.1.3 intends to address waste site rehabilitation. Yet it concludes only that "Site rehabilitation will consider potential site re-use." We feel that site rehabilitation and re-use should be more fully addressed in this EA to indicate whether in fact any re-uses are possible. We are not convinced by this EA that agricultural re-use is physically possible considering, for example, the toxics in the waste and the height of the final site above the water table.

Again, we were disappointed to read that agriculture is not mentioned as being part of the selection process for the landfill sites either at Lambton GS (see section 6.2.2.4) or at Nanticoke GS (see section 6.3.2.4). Furthermore section 6.3.1.4 Socio-Economic Effects - Zoning does not acknowledge the long-term commitment to agriculture for those lands in the Agricultural designation which are proposed for landfilling at Nanticoke GS.

In neither the Lambton GS nor Nanticoke GS areas does the EA give data on the agriculturally designated, suitable and used areas to be affected by the landfill sites.

Finally, Figure 6-19, the only air photo for the Nanticoke GS area in the EA does not show the complete area that will be covered by the proposed landfill sites.

Chapter 8, Program Implementation

We are concerned that the EA before us commits us to accepting the proposed landfilling, without the options to landfilling having been fully investigated (see section 8.1.1.1).

As for the Project Implementation Reports (PIRs) for specific installations, section 8.1.1.3 contains no requirement that optional FGD technologies (including waste management options) actually be considered and discussed in each PIR. It appears to us, that a PIR will focus on describing (a) the environmental effects, (b) the mitigation/compensation measures for those effects, and (c) the subsequent monitoring for the FGD technology chosen by Ontario Hydro.

Finally, while Chapter 9 discusses the process for "bumping up" an activity under an FGD EA amendment, it appears that no such "bump up" opportunity exists for a PIR. We are concerned that a PIR may not fully evaluate alternative FGD technology (including waste management) opportunities available to Ontario Hydro. There are issues that have not been fully investigated yet, and may not be investigated in the future given the commitments made in this EA to allow any of the four FGD technologies to be implemented and to allow the landfilling proposed.

Chapter 9.0, Amendments

This chapter discusses the amendment process, noting that an amendment to the EA is required if a new site is to be considered for landfilling. We support this requirement.

TT:tt
March, 1988
h:fgdea1.tt

Ministry of Community and Social Services
Ministère des Services sociaux et communautaires
Ontario

084

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March 16, 1988

Mr. Wes Green
Review Co-ordinator
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Dear Mr. Green: Re: Ontario Hydro-Environmental Assessment
Flue Gas Desulphurization Program
EA File # OH-GE-02

As requested, the above noted Environmental Assessment (EA) has been reviewed.

In that this EA will not have any direct impact on programs provided by the Ministry of Community and Social Services, the Ministry has no comment to add to the review process.

Thank you for having kept us informed of the progress of this EA through its' development stages.

Yours truly,

Peter Landry
Manager

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Services

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April 7, 1988

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Dear Mr. Green:

Re: ONTARIO HYDRO - ENVIRONMENTAL ASSESSMENT
FLUE GAS DESULPHURIZATION (FGD) PROGRAM
EA FILE NO. 0H-GE-02

Thank you for your letter of February 12, 1988, and a copy of the Environmental Assessment report on the above-noted project. As I indicated to Mr. M. McLeod of your office over the telephone the other day, I have reviewed the report and concluded that the project will not impact on this ministry's mandate, policies and/or operations.

As you have requested, my reply to the seven questions raised in the attachment #1 to your letter, are:

1. The data, analysis and conclusions in the EA appear satisfactory. I feel that the relevant issues have been covered in sufficient detail; the methods and techniques described in the EA to predict environmental effects and their mitigation measures, in my opinion, are adequate.

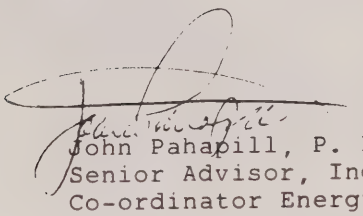
2.3,4,5 & 6.

Because of the limited time and resources available to me for this review, and due to the fact that the project does not impact directly on this ministry's mandate, policy and/or operations, I am not in the position to offer further comments on these five questions.

.../2

7. The role played by this ministry, through me, during the pre-submission consultation was a member of the government (external) review team.

Yours truly,



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087

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Your File:

Our File:

June 30, 1988

Mr. Brian Ward
Director
Environmental Assessment Branch
Ministry of the Environment
135 St. Clair Avenue West
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M4V 1P5

Attention: Wes Green

Dear Mr. Ward:

RE: Ontario Hydro - E.A. File No. OH-GE-02
Flue Gas Desulphurization (FGD) Program

Thank you for the opportunity to comment on the above document.

Because acid rain has a corrosive effect on both above-ground stone and masonry structures as well as on buried bone in archaeological sites, we support any undertaking that reduces its impact in the environment.

At the same time any undertaking that changes minimally undisturbed grade, has the potential to disturb archaeological deposits. Such disturbance should be preceeded by heritage resource assessment, evaluation of potential impact and avoidance or mitigation, of impact. This comment would apply to Hydro's expansion onto any properties for the purposes of new facility construction.

If you have any question please do not hesitate to contact me.

Sincerely yours,

Robert Montgomery
Director, Heritage Branch

RM/vc

42:054

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March 23, 1988

Mr. Wes Green
Review Coordinator
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Dear Mr. Green:

Re: Ontario Hydro - Environmental Assessment
Flue Gas Desulphurization (FGD) Program
EA File # OH-GE-02

Thankyou for sending this office the material on the above captioned EA.

It is the mandate of this Ministry, with regards to environmental assessments, to ensure that the school board or boards' within whose jurisdiction the study falls, are being advised and consulted.

Please find attached the addresses of the six school boards to be contacted. If these school boards perceive there to be a problem with the EA which they feel unable to resolve, then this Ministry will attempt to assist them in the problem resolution.

As long as the school boards are kept informed and their concerns satisfied this Ministry need not have any further part in the environmental assessment. We would appreciate, however, being left on the mailing list for information only.

Yours truly,

Steven Mitchell.

Steven Mitchell
Architect

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Ministry of Energy / Ministère de l'Énergie

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090

March 31, 1988

MEMORANDUM TO: Wes Green
Environmental Assessment Branch
Ministry of the Environment

FROM: Larry Moore
Coordinator
Electricity Planning Policy
Electricity Section

SUBJECT: Ministry of Energy Comments on Ontario Hydro's FGA Environmental Assessment

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The control of Ontario Hydro's acid gas emissions is a complex topic. Ontario Hydro is committed to provide in January 1989, a plan for meeting the emission levels set in Regulation 281/87. An extensive review of approaches to meeting Ontario's future electricity needs is also underway. The decisions coming from this review could have a profound effect on the need to use the existing coal-fired plants. Finally, the Ministry of the Environment is contemplating a revision of Regulation 308 to control pollution at its source. This revision could tilt the decision-making process toward scrubbers and away from approaches that would limit the amount of coal burned.

The decisions related to the control of acid gas emissions will result in the expenditures of billions of dollars. This level of expenditures demands a close examination of the options. For example, would this money be best applied by funding an aggressive electricity conservation program, or a program to develop Ontario's hydroelectric resources, or a program to support several thousand MWs of private generation? These concepts are touched on in Ontario Hydro's assessment but not fully developed. Before actually proceeding with an installation of

scrubbers, these matters should be thoroughly reviewed. The January report along with a resolution of the Demand/Supply Planning Strategy will contribute to our understanding of these matters but further review may well be needed at the project implementation stage.

This program EA gives a good technical overview of the developing field of flue gas desulphurization. The four technologies are well explained and the need to include new technology is covered. The necessity to cover all options at all stations means that considerable documentation will be required when a decision is made to actually implement parts of the proposed program.

The program advanced by Ontario Hydro is satisfactory in general. It is essential that acid gas emissions be closely controlled and providing Ontario Hydro with flexibility in alternative methods for controlling these emissions is desirable. The only serious concern is the need for a more thorough review of the options either at the program stage or at the implementation approval stage.

The Ministry of Energy participated in presubmission consultation on this program. A number of concerns were raised at that time. These included:

- poor definition of the purpose of the undertaking;
- a need to consider the review of the draft planning strategy and other major reports before actual implementation;
- a lack of balance in the treatment of the alternatives;
- more detail required on costs of scrubbers and their operation.

Information on these matters was improved in the final document, with the exception of a balanced treatment of the alternatives. As previously mentioned, a more thorough review of these is recommended at the implementation approval stage.

I trust this review assists you in preparing the overall Government review on this program.

Laurence F. Moore

cc: C. B. Jutlah
I. B. MacOdrum

2670c/35c

Ministry of the Environment
Ministère de l'Environnement
Ontario

092

ENVIRONMENTAL APPROVALS AND LAND USE PLANNING BRANCH

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April 15, 1988

MEMORANDUM

TO: W. Green
Review Co-ordinator
Environmental Assessment Branch

FROM: J. Toth, P. Eng.
Manager
Consulting & Value Engineering Services Section

RE: ONTARIO HYDRO - ENVIRONMENTAL ASSESSMENT
FLUE GAS DESULPHURIZATION (FGD) PROGRAM
EA FILE NO. OH-GE-02

The Ministry of the Environment (MOE) has completed its review of the above-noted document in accordance with your memorandum of February 12, 1988. Please note that the original deadline for comments of April 1, 1988 was extended to April 15, 1988 following discussions with Mike McLeod of your Branch at a meeting held on March 28, 1988.

Attached to this memorandum are consolidated comments that represent the views of the following MOE Branches and Regions:

1. Air Resources Branch
2. Environmental Approvals & Land Use Planning Branch (Waste Sites and Systems Support Unit, Land Use Planning Section, and Consulting and Value Engineering Services Section)
3. Hazardous Contaminants Co-ordination Branch
4. Waste Management Branch
5. Water Resources Branch
6. Central Region (Halton-Peel District Office)
7. Southwestern Region (Sarnia District Office)
8. West Central Region
9. Policy and Planning Branch (Acid Precipitation Office)

If you have any questions or would like to discuss this matter further, please call me at 323-4498.

J. Toth

PD/lh

Enclosure

cc: Ms D. Barker - Ontario Hydro
C.E. McIntyre
W.R. Balfour
G. Nelson
K. Haniff (Attn: J. Sharma)
B. Hansler
K. Smith
G. Donnelly
G. Endicott
W. Ng
P. Isles (Attn: C. Ramchandani)
G. Casonata
P. DeAngelis
D. Neufeld

CONSOLIDATED MOE REVIEW COMMENTS ON ONTARIO HYDRO'S "FLUE GAS DESULPHURIZATION PROGRAM (FGD) ENVIRONMENTAL ASSESSMENT February, 1988"

Policy Concerns

1. During the course of the Environmental Assessment (EA) review, three policy concerns emerged out of the consideration of specialized technical issues. These wider concerns encompass some of the particular points raised elsewhere, but are shown below to emphasize their policy nature and ensure that they receive appropriate attention in subsequent review.

   - The EA maintains that alternative FGD systems and processes, which can produce usable products, are uneconomic. In Section 3.2.3.1, the comment is made that:

     > "In Japan and Europe (West Germany), where there are restraints on widespread throw-away practices for disposal of power plant wastes, the utility companies have adapted to their circumstances; they have been broadly successful in operation of by-product type FGD processes."

     Circumstances are also changing in Ontario, driven by environmental and long term economic concerns about a sustainable use of resources. We are concerned that the EA document is expressing a rather dated, narrow view.

- Some types of conservation are discussed, but Section 3.1.2.1 notes that off-electricity programs "are unlikely to have much support, except under extreme conditions dealing with supply shortages. Their effects have not been quantified." Hydro's perception of the public's inherent lack of support for conservation is not documented, nor are institutional barriers examined. It is our perception that many conservation opportunities exist, and that the nuclear retubing program and higher-than-expected increases in demand emphasize the need for a re-examination of the conservation issue.

- New approaches for air and water pollution in process under the provincial Clean Air (CAP) and MISA programs, are broadly based on the use of best available technology. Hydro was made aware of these current and impending changes. It should be clear that the newer and tougher pollution control standards will have to be met, while offering no opportunity for delay in implementing the acid gas controls necessary to abide by Regulation 281/87.

2. To fully satisfy the concerns of the communities affected by the proposed FGD program, the Ministry of the Environment recommends that a public hearing be held under the Environmental Assessment Act.

Technology

1. The treatment of alternative methods for the undertaking remains somewhat superficial. The dismissal of regenerable technologies, other than gypsum production from conventional limestone scrubbing, appears to be based solely on cost. No attempt appears to have been made to weigh the environmental benefit associated with such technologies against the

cost element in a rigorous fashion. This contrasts against the screening criterion which justifies inclusion of LIF technology, i.e., "Emerging Technologies Suited to Ontario Hydro Needs". How LIF uniquely meets this criterion is not discussed very extensively. It is unclear, for example, how LIF differs significantly from the so-called "cool side" sorbent injection technologies also in moderate to advanced development.

2. Further to the previous comment, the criteria used for the screening of the FGD process (page 3-12) do not include the impact of technology on the volume of waste generated. Since waste disposal is one of the major issues, Ontario Hydro should take a close look at regenerable technologies and check if they would impact on the conclusion reached regarding the choice of any one technology. The evaluation should include the use of regenerative processes such as the production of liquid SO_2, elemental sulphur, and/or sulphuric acid, as well as commercial grade FGD gypsum for sale to wallboard and/or cement manufacturers, as a method of reducing the amount of waste generated.

   The Ministry does not see the relevance of the estimate that the cost of producing commercial wallboard is actually 75 times the cost of the land (page 3-18). An economic analysis should include, not only the cost of the land, but also the costs of operating, monitoring, closing, and maintaining a landfill site.

3. The EA document establishes FGD systems as viable means of reducing sulphur dioxide emissions from Ontario Hydro coal fired generating stations, as they have done on many installations in the United States, Europe, and Japan. The advantages of reducing sulphur dioxide emissions may be, at least partially,

offset by increased fugitive emissions of particulate, and by a potential for fogging and acid droplet fall-out effects in the vicinity of the generating station, if adequate steps are not taken to control them.

4. With respect to waste utilization options (Section 3.2.3.1), it is recommended that a major emphasis be placed on the recycling of ash/wastes from FGD systems, and that the FGD systems be selected to maximize recycling of the ash and other wastes.

   The present ash from Lakeview is now recycled as a cement additive. A FGD system at Lakeview will most likely change the ash characteristics, and may make the ash unsuitable for recycling.

5. A major retubing program at Pickering, originally planned to commence 10 years from now, will begin next year. What impact will this change in schedule have on the generating requirements of the coal fired stations and the FGD Program? Will the projections and conclusions presented in Chapters 1, 2, and 3 change? These items should be discussed in the EA document.

Land Use

1. Land use compatibility is of concern where a land use proposal has the potential to create an adverse environmental effect by locating in proximity to sensitive land uses. Consideration must be given to all sensitive uses that exist within the area of influence around a waste disposal area. Of particular concern to this Ministry are sensitive land uses within 500 metres of the proposed waste disposal area. Any proposal to establish a waste disposal area adjacent to an existing sensitive use should

recognize that, in the opinion of the Ministry of the Environment, adequate separation of incompatible land uses is the most desirable method of mitigating adverse environmental effects and that it is the policy of this Ministry to recommend the separation of incompatible land uses, where deemed necessary.

Although the document does not identify residential buildings in proximity to the proposed waste disposal sites at Lambton and Nanticoke, it appears that a number of residential buildings are found within the influence area of one or more of the proposed waste disposal sites. Further, the potential environmental effects discussed in the document are not specifically related to the adjacent sensitive uses. The location of all sensitive land uses, such as residential buildings within 500 metres of the perimeter of the candidate waste disposal sites, should be specified on appropriately scaled maps. In addition, the ownership of properties within the area described in Schedules A and B of OH-24/2 should be outlined in the text of the document and should be reflected in the appropriate maps. Further, the presence and impact of any adverse environmental effects on the identified sensitive uses must be evaluated and discussed.

2. Section 5.2 (Nanticoke Generating Station), page 5-15, should include a subsection on "surrounding communities and land uses" to make it consistent with discussions on Lambton and Lakeview.

Waste Disposal

1. The EA document states, in several sections (e.g., page (i), second paragraph; page 2-1, fourth paragraph; page 10-1, first paragraph), that the primary focus is "on the localized environmental effects and proposed mitigation related to the

construction, operation, and decommissioning". However, the EA document contains only general comments on generic waste site rehabilitation (Table 6-1). A more detailed discussion dealing with plant decommissioning, waste site closure, and related environmental impacts for each of the three sites should be provided.

2. The disposal of waste generated from the FGD systems is a major consideration. The EA document provides waste disposal options and requirements for off-site disposal lands. However, candidate waste disposal sites have been identified only at Lambton and Nanticoke (pages 3-20 and 3-21, Sections 3.2.3.2 and 3.2.3.4). No viable option for waste disposal has been presented for Lakeview; therefore, the EA document is deficient in this regard. It is realized that a separate study is now underway to find an acceptable solution to the waste disposal problem at Lakeview. However, since Hydro is seeking its Program EA Approval for all the three sites (Lambton, Nanticoke, and Lakeview), it would be necessary for Hydro to provide additional information regarding the long term management and/or disposal of the Lakeview Generating Station waste. In addition, since there has been no site yet selected for landfilling of wastes from a FGD system at Lakeview, a separate submission under the Environmental Assessment Act would be required when a disposal site is selected.

3. The process for choosing the alternatives for the waste disposal sites appears to be reasonable; however, it should be emphasized that much more detail will be required for approval under the Environmental Protection Act. During the approvals process, Ontario Hydro will have to submit a detailed design and operations plan, a contingency plan, a groundwater and surface water monitoring plan, a hydrogeological study, and a surface water control

plan for each site. These plans will have to address such issues as wafting of dust from gypsum stacks, surface water runoff, and potential for groundwater leachate migration.

In the Ministry's letter to Ontario Hydro of August 14, 1987, the Ministry stated:

> "In their EA, we expect Hydro will establish an area of search around each generating plant, based on some rationale (i.e., such as ash transportation costs, etc.), and apply various weighted criteria, such as hydrogeologic conditions, land use, population, agricultural capability, etc., to systematically evaluate alternative site locations. The objective of this exercise is to arrive at a preferred site location for each landfill. More detailed approvals for the selected site under Part V of the Environmental Protection Act would then be obtained. To allow for the possibility of a preferred site not being acceptable once detailed investigations have been carried out, it would be beneficial to rank the better alternative site locations in the EA."

Ontario Hydro has chosen not to do this; therefore, if a preferred site is not acceptable when the detailed studies have been completed, Hydro must return to the EA process to choose a site.

4. On page 6-18, Ontario Hydro states that it may also be possible to consciously reduce the exposed working area within a landfill by pursuing a modular landfill development philosophy. The Ministry prefers a landfill site to be developed in phases (i.e., modules), since this method of development would alleviate a number of problems, such as wind blown gypsum dust. It should be noted that these methods

may require daily soil cover and, therefore, a greater disposal area, since the volume of waste and cover material would increase. The Ministry intends to pursue this with the proponent during the Environmental Protection Act approvals process.

5. Section 4.2.1.4 (Waste Products), page 4-5, discusses leachate characteristics of the FGD waste, makes reference to Table 4-4 and Table 4-5 (page 408), and states that the waste may exceed the Regulation 309 leachate quality criteria for cadmium in some cases. Table 4-5 has been incorrectly represented. The values are accurate; however, for a waste to be declared "leachate toxic", it must produce a leachate that has contaminant concentrations in excess of 100 times that specified in Table 4-5. Therefore, based on the information provided in Table 4-4, the FGD waste would not be a leachate toxic waste as defined in Regulation 309.

6. Figure 4-16 (page 4-29), Figure 4-17 (page 4-30), and Figure 4-18 (page 4-32) outline the waste disposal area required for each of the three sites. Under the worst case situation, using the LIF option, the Nanticoke site would required 205 ha. Since 223 ha are available, 18 ha would remain to accept waste from the Lakeview Generating Station (provided this scenario is approved). This means that there will be a substantial shortfall, considering that 72 ha will be required to handle the total waste from Lakeview. Therefore, the length of time that the Nanticoke site would be available for waste from Lakeview would be limited and an alternative disposal site for Lakeview must be approved and in place well before the Nanticoke site has been filled to capacity.

7. The gypsum waste disposal site for the Lambton Generating Station would be preferable to the east of the station and not to the north side to minimize any

potential impact on Courtright. This concern was also expressed by Mooretown Council by earlier written communication to Ontario Hydro.

8. The document indicates that a properly rehabilitated waste site should provide an opportunity for a variety of potential end uses, ranging from agricultural to residential. However, the feasibility of rehabilitating mounds of FGD waste by-products with stacking heights ranging up to 27 metres and occupying hundreds of hectares has not been established. Therefore, reference to rehabilitation for these end uses is not appropriate without some discussion of feasibility. In addition, Section 45 approval under the Environmental Protection Act may be necessary for re-using former waste disposal sites.

Air Emissions

1. There is inadequate information in the submission received to comment on the adequacy of the analysis performed in support of Ontario Hydro's positions in several key areas. As one example, most of the back-up detail which would be of interest in the area of the existing atmospheric environment and predicted air emission effects is referenced to "Wong (1987)", which is listed in the references as a work under preparation. We are not aware if this report has been supplied to the Ministry. We suggest that all relevant reports prepared by Ontario Hydro in support of this document should be made available to the parties to this environmental assessment as soon as possible.

2. We note that the emission factors derived by the U.S. E.P.A. are valid for particles in the size range 0 to 30 micrometres. This range is within that considered to be suspended particulate matter, not dustfall. Any monitoring efforts aimed at evaluating these

emissions should thus involve hi-vol samplers rather than the proposed dustfall jars. We also contend that these emission factors will tend to underestimate emissions - larger particles have a greater bias in determinations of total mass emissions, and Ontario's standard for suspended particulate matter extends to 44 micrometres.

3. The matter of reheating wet exhausts versus use of specially designed wet stacks has been dealt with in a very limited way. As well, conflicting data is presented on this topic; in the section on the existing environment for each station, natural fogging is indicated to be expectable up to 2% of the time, while in the generic discussion on the potential problems with wet stacks, natural fogging is cited as occurring 11% of the time (using a different reference) - and the proposed wet stacks are predicted to induce fogging 15% of the time. The safety ramifications of this phenomenon, together with the nuisance and/or damage potential associated with rain-out of droplets containing high dissolved solids levels, give rise to concern.

4. What modelling has been done appears to be compromised. We would expect that modelling using the Regulation 308 routines would be done for both the existing situation and the situation with FGD installed in order to permit a comparison (for all contaminants). Only calculation results for the case with FGD installed are presented, and for particulate emissions, no attempt is made to take the fugitive and stack emission effects together in the aggregate as required by the Regulation. For gaseous pollutants, no attempt is made to estimate fugitive emissions.

The results of the limited modelling done suggest that Regulation 308 point of impingement requirements

would not be met at any of the three stations studied. Nonetheless, Ontario Hydro makes no firm proposals or commitments for amelioration of the situation, nor is any statement made that Ontario Hydro intends to comply with the requirements of Regulation 308. Staff of the Ministry's Regional Operations Division have noted that particulate-related complaints are routinely noted with respect to all three stations in question, and these concerns are documented in the EA document as having been raised at the public sessions near both the Lambton and Nanticoke stations.

5. No firm proposals or commitments are made for the mitigation of emissions arising from construction activities, despite the requirements of Section 11 of Regulation 308. Indeed, Hydro does not acknowledge the existence of Section 11 in its discussion of the regulatory framework, dwelling instead on post-EA approvals solely.

6. Table 6-14 (page 6-23), Table 6-21 (page 6-36), and Table 6-27 (page 6-45) all have errors in the last column (Ontario Regulatory Limit). The limits for arsenic, chromium, and manganese now in effect are 1 $\mu g/m^3$ (As), 5 $\mu g/m^3$ (Cr), and 7.5 $\mu g/m^3$ (Mn).

7. With respect to operational monitoring requirements, no mention is made of continuous emission monitors for sulphur dioxide, nitrogen oxides, opacity or combustion parameters. Such provisions have been sought routinely by this Ministry for other significant sources of air pollutants, and are in line with proposals contained in the Discussion Paper on the Clean Air Program (CAP). Continuous monitoring is also noted as a feature under Environment Canada's National Emission Guidelines.

8. Conflicting information is also presented on the topic of flue gas by-pass. In different areas of the document, availability factors for the FGD systems are noted to be 95% or 90%. As well, the discussion on forced outages includes reference to start-up situations in one case, but not others. The Ministry maintains its position that the incidence of control equipment by-pass should be minimized, and serious consideration given to the option of shutting down a generating unit if its FGD system fails. The cost ramifications of this option should be weighed against the costs of building a more redundant system which would not fail completely during the forced outage of a component or subsystem. The matter of expected frequencies and durations of forced outages based on experience elsewhere with similar designs should be addressed, and Ontario Hydro should be prepared to commit to a maximum permitted outage specification. Modelling results, supported by adequate raw data to permit verification, should be presented to support the contention that Regulation 308 would be complied with during by-pass situations.

9. There are many proposals contained in the Discussion Paper on the Clean Air Program which might, if implemented, have a significant impact on the FGD Program. We suggest that it might be most appropriate for Ontario Hydro to prepare an addendum to this EA document addressing the impact of these proposals, as the approving authority (the Minister of the Environment or the Environmental Assessment Board) will likely have an interest in this aspect due to the extended period covered by this Program EA.

Wastewater

1. Section 4.2.1.8 (Environmental Concerns), page 4-9, discusses the mixing of a liquid blowdown stream

(high in chloride concentration) with condenser cooling water to reduce the chloride concentration to acceptable levels (< 10 ppm). In general, the concept of dilution to meet effluent requirements is not in line with Ministry philosophy. In addition, the proposed MISA regulations will, in all likelihood, prohibit such a practice. Therefore, alternative treatment options should be presented in the EA document to meet effluent requirements.

2. Section 6.1.2.3, page 6-13 (Wastewater Discharge), should include the full title of Environment Canada's Codes of Practice (1985) as follows:

> "Environment Canada's Environmental Codes of Practice for Stream Electric Power Generation - Design Phase (Report EPS 1/PG/1, March, 1985) and Appendices - Design Phase (Report EPS 1/PG/1A, December, 1986)."

3. Section 6.1.2.3, page 6-13 (Treatment), the last line in the third paragraph should be changed to read:

> "If necessary, Ontario Hydro will install "Best Available Technology Economically Achievable (BATEA) ... to meet MOE's Water Quality Objectives and future anticipated MISA Effluent Limits Regulations."

4. Page 6-16, the third paragraph should be changed to read:

> "More sophisticated process design ... If a wastewater blowdown is required, it would be treated to meet MOE Quality Objectives as described in Table 6-7 and MISA Effluent Limits Regulations."

5. Page 6-16, the sixth paragraph should be cancelled or rephrased to reflect the impending MISA Regulations.

6. Page 6-18 (Leachate and Runoff), any direct discharges to receiving waters will be assessed under the future MISA Effluent Limits Regulations for all the affected sites.

7. Section 4.3.1.1 (Waste Management), page 4-28, and Section 4.3.2.1 (Waste Management), page 4-31, states that "wastewater treatment will be incorporated, as required, if an open-loop FGD system is installed". More detailed information with respect to the type of wastewater treatment proposed and expected effluent quality should be included in these sections.

Miscellaneous

1. The "Mississauga Wastewater Treatment Plant", referred to in Sections 5.3.2 and 5.3.7, is the Lakeview Wastewater Treatment Plant. The "Etobicoke Water Treatment Plant" is the Lakeview Water Treatment Plant.

2. Figure 4-17 (page 4-30), Column 3 (Available Area), for LSD, LS, and LDA should be 141 ha (based on 95 ha for A and 56 ha for C).

3. The figures in the table found on page C-17 do not match with the corresponding area requirements listed in Figures 4-15, 4-16, and 4-17.

4. Section 8.1.1.6 (page 8-4) outlines an extremely optimistic time frame for securing the various approvals under the Environmental Protection Act (EPA) and the Ontario Water Resources Act (OWRA). The Approvals Section may require a minimum of 8 to 10 weeks to process these applications.

Ontario Hydro has not as yet implemented any co-ordinated attempt at setting up communication with staff of this Ministry to ensure that prompt processing of post-EA approvals can occur. Given the mere 30 day comment period insisted upon for PIR comments or requests for bump-up in case of a proposed amendment, it is surprising that Ontario Hydro has not suggested when its first notification for presubmission consultation might be given. When one considers that the PIR for the first site may be ready at about the same time as approval of this EA is hoped for (mid 1989), it is a matter for some concern that no technical contact on the process selection studies has occurred between Hydro and the Ministry. There is a clear need for such close communication given the tight timing of Hydro's needs for approval, and the concomitant need for Hydro to meet its requirements under, not only O. Reg. 281/87, but also Section 8 and Part V of the Environmental Protection Act, as well as Section 24 of the Ontario Water Resources Act. Failure to arrange the necessary degree of communication, as suggested by Ministry staff on several occasions, would place the responsibility for violation of any relevant regulatory requirement entirely with Ontario Hydro, along with any potential for enforcement action.

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May 2, 1988

MEMORANDUM

TO: W. Green
Review Co-ordinator
Environmental Assessment Branch

FROM: J. Toth, Manager
Consulting & Value Engineering Services Section

RE: ONTARIO HYDRO - ENVIRONMENTAL ASSESSMENT
FLUE GAS DESULPHURIZATION (FGD) PROGRAM
EA FILE NO. OH-GE-02

Further to my memorandum of April 15, 1988, I would like to clarify item 2 under "Policy Concerns" of the "Consolidated MOE Review Comments" on the above-mentioned program.

The major reason that staff suggested a public hearing under the Environmental Assessment Act was that there are a number of policy and technical concerns regarding the proposed FGD program that remain and should be resolved before approval is given. However, such a suggestion may be premature at this time because Ontario Hydro still has the opportunity to resolve these outstanding issues to the satisfaction of Ministry staff.

I trust this clarifies the position of Ministry staff on this matter.

J. Toth

PD/mc

cc: C.E. McIntyre
W.R. Balfour
G. Nelson
K. Haniff (Attn: J. Sharma)
B. Hansler
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110

October 4, 1988

M E M O R A M D U M

To: B. Ward, Director
Environmental Assessment Branch

From: E. Piché
Director
Air Resources Branch

Re: **Ontario Hydro's Environmental Assessment Submission for a Flue Gas Desulphurization Program - Review of Supplementary Information**

We have received some additional information regarding concerns over the treatment of issues relating to the atmospheric environmental effects from the subject program activities. This additional information, combined with our recently finished cursory review of the reference (Wong 1988) provided by Hydro, reinforces our previous comments.

My staff feel that the submission by Ontario Hydro remains deficient in its assessment of both alternative and "candidate" technologies for secondary air quality effects, particularly fugitive emissions of particulate matter. Our assessment indicates that Ontario Hydro is likely to be exceeding particulate levels prescribed under Regulation 308 even under current circumstances. Disposal areas for FGD waste and reagent handling will simply add to an existing problem; at Nanticoke and Lambton Generating Stations, this addition will be significant but not the dominant source. For Lakeview Generating Station, secondary effects due to FGD waste disposal will occur at some off-site location which cannot be assessed at this time; it is possible that initially, this material will be sent to Nanticoke for co-disposal with that station's wastes, adding to the impact there.

Notwithstanding our concerns, this Branch recommends that approval of Hydro's proposal can proceed without a hearing provided several stringent conditions are attached. We take this stance as we know that the province's acid rain control program has set out deadlines which must be met, and we have seen that Ontario Hydro's past load forecasts underpredicted growth. Delay in approval might jeopardize compliance with Ontario Regulation 281/87, or, as Ontario Hydro spokesmen have indicated, result in limitations to power supply in Ontario - perhaps including brownouts and

other disruptions. At the same time, through the suggested conditions, this Ministry could send a clear message to Hydro that the identified areas of environmental concerns must be dealt with in the planning of their projects, and local air quality cannot be allowed to suffer in return for compliance with the acid gas regulation.

Therefore, we propose the following conditions:

- First, Ontario Hydro should be required to undertake a fugitive emissions assessment and control program at all three candidate station sites at once, in close consultation with Ministry Regional staff and this Branch. This assessment will identify sites where FGD waste disposal on adjacent lands cannot be tolerated, so that Ontario Hydro can assess the alternatives of off-site disposal or FGD processes which produce useable by-products if they prove necessary.

- Second, Ontario Hydro should be required to expand the study on the Wellman-Lord process referred to in their document, so that all three candidate sites are examined, and so that the effects of the Wellman-Lord process on fugitive emissions from the station are fully treated. Again, this should be done in close consultation with Ministry staff to ensure that these issues are treated to an adequate degree of detail.

  It should also be noted that, when seeking approval of a Project Implementation Report, this Branch will want to see the effects of all four candidate FGD processes on fugitive emissions explored fully, and differentiated rather than presented on the basis solely of "environmental acceptability". As we have informed Hydro on many occasions, an environmental assessment is not for the purpose of showing that regulations will be met, but for comparing environmental impacts from the alternatives. This comparison should have been done to examine all of the alternative methods for going about this undertaking; it must at least be done when justifying which candidate technology is to be used.

- Finally, Ontario Hydro should be required, either at regular intervals (e.g. 5 years) or at the request of any interested party to prepare an assessment of the current state of FGD technology which might be eligible to be considered a candidate for their purposes, or to assess the applicability of a particular technology in detail. There are no provisions in the current submission for any agency,

including this Ministry, to ask Hydro to consider or reassess technologies other than the identified candidates. Given the problems noted with the assessment of the relative effects of the alternatives, such a provision seems advisable.

We hope that you find these comments to be of assistance. We look forward to receiving the government review when it is available.

E. Piché

cc: D. Balsillie
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J. Hewings
K. Smith
T. Armstrong
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February 19, 1988

MEMORANDUM TO: Wes Green
Review Coordinator
Environmental Assessment Branch

FROM: W.M.C. Wilson
Land Development Branch

RE: Ontario Hydro - Environmental Assessment Flue Gas Desulphurization (FGD) Program EA File No. OH-GE-02

I have reviewed the above document sent to me February 12, 1988 on behalf of Ministry of Government Services.

Insofar as I am able to judge from a brief scan of the document, I believe Hydro has addressed alternatives, monitoring and the difficult matter of timing in an adequate manner so far.

No assets or interests of MGS would be affected by this program but the detailed implementation, including waste site operation could have adverse impact on MGS titled property. I am reassured, however, in the conclusion, Section 10.8, that MGS will have opportunity to review detailed design of committed FGD projects.

W.M.C. Wilson

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April 13, 1988

MEMORANDUM TO: Wes Green
Review Co-ordinator
Environmental Assessment Branch
Ministry of the Environment
135 St. Clair Avenue West
Suite 100, Toronto, Ontario M4V 1P5

RE: Ontario Hydro - Flue Gas E.A.

Further to my letter of February 14, 1988 on the above, I have no concern on behalf of Ministry of Housing.

W.M.C. Wilson
Environmental Coordinator
Land Development Branch

WW/ma

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Ministry of Industry, Trade and Technology
Ministère de l'Industrie, du Commerce et de la Technologie

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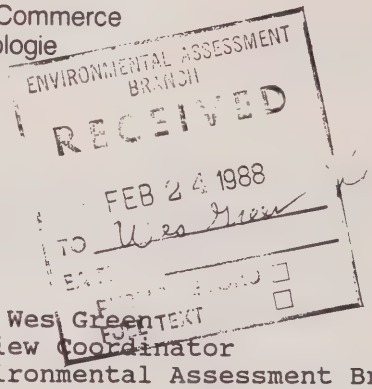


February 23, 1988

Memorandum to: Mr. Wes Green
Review Coordinator
Environmental Assessment Branch
Ministry of the Environment

From: Mr. J. R. Delaney
Manager
Plant Location and
Municipal Liaison.

Subject: Ontario Hydro - Environmental Assessment
Flue Gas Desulphurization (FGD) Program
EA File No. OH-GE-02

This proposal does not appear to impact on the programs or policies of this Ministry. We do not have technical expertise to comment on a program for Flue Gas Desulphurization. This Ministry therefore cannot provide input to this environmental assessment.

We are returning the document provided for your use.

for J. R. Delaney.

JRD/vh

Ontario

Ministry of Municipal Affairs

Ministère des Affaires municipales

777 Bay Street, 13th floor
Toronto, Ontario
M5G 2E5

585-6228

110

April 13, 1988

MEMORANDUM TO: Wes Green
Review Co-ordinator
Environmental Assessment Branch
Ministry of the Environment

FROM: Ron Kennedy, MCIP
Senior Planner

RE: Ontario Hydro Environmental Assessment -
Flue Gas Desulphurization (FGD) Program
EA File OH-GE-02

The Ministry of Municipal Affairs has reviewed this environmental assessment and concludes that our policies and programs are not adversely affected.

The Planning Act requires that when a Provincial agency considers that an undertaking will affect a municipality, the agency is to consult with the municipality and give consideration to its planning policies. We are satisfied that Ontario Hydro has met the obligation to consult, as documented in section 7.1.4 of the assessment. We are also satisfied that it has considered the impact of the undertaking in light of the municipal planning policies and land uses surrounding the three generating stations. Accordingly we have no objection to the acceptance of the assessment and approval of the undertaking.

R. R. Kennedy

Ontario

Ministry of
Northern Development
and Mines

Ministère du
Développement du Nord
et des Mines

10 Wellesley Street East
Toronto, Ontario
M4Y 1G2

10 est, rue Wellesley
Toronto, Ontario
M4Y 1G2

April 15, 1988

APR 20 198

OFFICE OF
THE DIRECTOR

Mr. Brian Ward
Director
Ministry of the Environment
135 St. Clair Ave. W.
Suite 100
Toronto, Ontario
M4V 1P5

Dear Mr. Ward: Brian

Re: Ontario Hydro - Environmental Assessment of the Flue Gas Desulfurization Program - your file OH-GE-02

The document relating to the above topic has been reviewed.

This ministry offers no comments.

Thank you for the opportunity to review this report.

Yours sincerely,

Bill Stevenson

W. W. Stevenson
Director
Corporate Planning Secretariat

cc: G. K. Ormerod

Ontario

Ministry of the Solicitor General

Office of the Fire Marshal

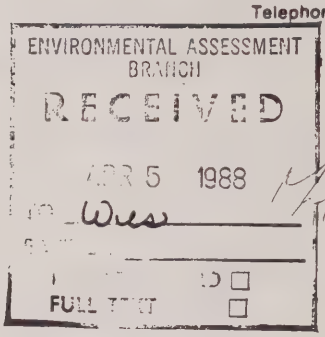
Public Safety Division

7 Overlea Blvd., 3rd Floor
Toronto, Ontario
M4H 1A8

Telephone: 965-4852

681 28

March 23, 1988



Mr. Wes Green
Review Coordinator
Environmental Assessment Branch
Ministry of the Environment
135 St. Clair Ave. West
Suite 100
Toronto, ONtario
M4V 1P5

Dear Sir:

Re: Ontario Hydro - Environmental Assessment
Flue Gas Desulphurization (FGD) Program
EA File No. OH-GE-02

We have reviewed Ontario Hydro's Environmental Assessment (EA) of the FGD program. The program represents a method to reduce acid gas emissions from coal-fired generating stations at Lambton,Lakeview and Nanticoke.

The candidate FGD processes and facilities described in Ontario Hydro's EA are anticipated to represent minimal fire hazards. The collection of flammable gases such as hydrogen sulphide are not part of the FGD technologies discussed in the EA. This process would have represented the one area identified by this Office for further review.

In response to the questions found in Attachment #1 of your February 12th, 1988 letter, we answer in the affirmative to the first six inquiries. This Office was one of the two government reviewers on behalf of the Ministry of the Solicitor General, the other being Ontario Provincial Police.

With respect to our mandate dealing with the delivery of emergency services and fire safety and prevention, we have no concerns to offer on Ontario Hydro's Environmental Assessment on the proposed Flue Gas Desulphurization program.

Yours truly,

R. R. Philippe, P. Eng.
Chief
Technical, Research and Consulting Services
RRP:DH:sjm
cc: CJA Coles, Director, Policy Planning, OPP

Ontario Provincial Police

Ministry of the Solicitor General

90 Harbour Street
Toronto, Ontario
M7A 2S1
Telephone:
965-2542

File reference:
601 10 40
159 88-061

11 Mar 88

MEMORANDUM TO:

Ministry of the Environment
Environmental Assessment Branch
135 St. Clair Ave. West
Toronto, Ontario
M4V 1P5

ATT: Wes Green
Review Coordinator

RE: Ontario Hydro - Flue Gas Desulphurization Program

The assessment documents in regard to the captionally noted program, have been reviewed by Cpl. R.S. Taplay of this Branch.

It does not appear that the program will have a direct impact on general policing services. In addition, we do not feel it necessary for us to review further reports or documentation concerning this program.

Thank you for allowing us the opportunity to participate in this review process.

C.J.A. Coles, Superintendent
Director
Policy and Planning Branch

RST/jt

Ontario

ONTARIO incredible! ONTARIO irresistible!

Ministry of Tourism and Recreation
Ministère du tourisme et des loisirs

77 Bloor Street West
Toronto, Ontario
M7A 2R9

77 rue Bloor ouest
Toronto, Ontario
M7A 2R9

March 2, 1988

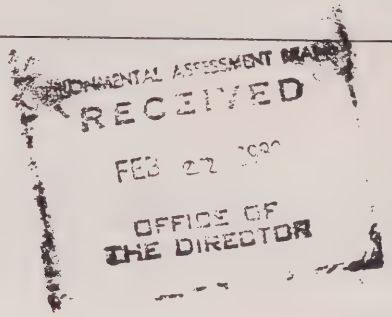
To: Wes Green
Review Coordinator
Environmental Assessment Branch

Re: ONTARIO HYDRO-EA
FLUE GAS DESULPHURIZATION PROGRAM

Ministry staff have reviewed the above-noted document and found that tourism and recreational concerns have been adequately covered.

Ruth Cornish
Director
Strategic Policy Branch

Ontario Ministry of Transportation
Ministère des Transports



Environmental Office
2nd Floor, West Building
1201 Wilson Avenue
Downsview, Ontario
M3M 1J8

February 17, 1988

Mr. B. Ward
Director
Environmental Assessment Branch
Ministry of the Environment
135 St. Clair Avenue West
Toronto, Ontario
M4V 1P5

Dear Mr. Ward:

Re: Ontario Hydro
Flue Gas Desulphurization Program
Environmental Assessment

This Ministry has reviewed the subject environmental assessment document and our comments are outlined in the attached review prepared by Mr. R.C. Hodgins, Manager, Environmental Office.

This is to advise that I concur with the noted review.

Yours truly,

E.J. McCabe
Executive Director
Highway Engineering Division

EJM/JF/gc
Attachment

c.c. R.C. Hodgins
A. McConnell
P. Billings
Executive Director's File

MINISTRY OF TRANSPORTATION

REVIEW OF ENVIRONMENTAL ASSESSMENT REPORT

Re: Ontario Hydro
Flue Gas Desulphurization Program
Environmental Assessment

The Ministry has no comments or concerns regarding the subject environmental assessment document. There is, therefore, no objection to the approval of the undertaking.

R.C. Hodgins
Manager
Environmental Office
Tel: 235-3479

RCH/JF/gc

Ontario

Ministry of Treasury and Economics
Ministère du Trésor et de l'Économie
Sectoral and Regional Policy Branch
4th Floor, Frost Building North

Queen's Park
Toronto, Ontario

April 12, 1988

MEMORANDUM TO: Wes Green
Review Coordinator
Environmental Assessment Branch
Ministry of the Environment

FROM: Henk M. Ploeger
Director

RE: Ontario Hydro Flue Gas Desulphurization Program
EA File NO. OH-GE-02

As noted in your recent telephone conversation with Carol Lonero, this Ministry has no comments to submit on the above submission.

Henk M. Ploeger

CN

Operation Services
Northern Ontario District
Suite 504
277 Front St. West
Toronto, Ontario
M5V 2X7

30 March 1988

Ministry of the Environment
Environmental Assessment Branch
135 St. Clair Ave. W.
Suite 100
Toronto, Ontario
M4V 1P5

Attn.: Mr. W. Green

Dear Sir

Re: Ontario Hydro and Environmental Assessment
Flue Gas Desulphurization (FGD) Program - EA File No. OH-GE-02

CN has reviewed the above-noted environmental assessment received under cover of your letter of 12 February 1988.

Although not reviewed in detail, the EA appears to be thorough and quite satisfactory from CN's point of view. Ontario Hydro's desire to reduce emissions/acid rain to below regulatory levels is commendable and is supported by the Railway.

Thank you for the opportunity to have participated in the review process.

Yours truly

N. D. Coleman
For: D. A. Reynolds, P. Eng.
Technical Support Engineer

NDC/T9611

Att.

cc: Mr. R. J. Spence Environmental Protection Officer Toronto

Environment Canada
Conservation and Protection

Ontario Region
25 St. Clair Avenue East
Toronto, Ontario
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Environnement Canada
Conservation et Protection

Région de l'Ontario
25, avenue St. Clair est
Toronto (Ontario)
M4T 1M2

4340-12-11

April 20, 1988

Mr. W. Green
Environmental Assessment Branch
Ministry of the Environment
135 St. Clair Avenue West
Toronto, Ontario
M4V 1P5

Dear Mr. Green:

Attached are Environment Canada's review comments on Ontario Hydro's Flue Gas Desulphurization (FGD) Program Environmental Assessment (February 1988).

Topics in the review include consistency with Environment Canada's Environmental Codes of Practice for Steam Electric Power Generation, FGD by-product utilization, flue gas re-heat, fugitive dust control, possible future nitrogen oxide controls and other requirements.

Our major concern is the lack of specific and unqualified commitment by the proponent in the EA document to appropriate mitigation measures for this long term program.

We hope our comments will assist in ensuring that appropriate environmental protection measures are taken for these first FGD systems in Canadian coal fired electrical generating stations.

Environment Canada staff would be pleased to further participate in the environmental assessment process.

Sincerely,

S. Llewellyn
Manager, Program Coordination
Environmental Protection
Ontario Region

Attach.

cc: W.R. Effner, Ontario Hydro

Canada

REVIEW OF

ONTARIO HYDRO FLUE GAS DESULPHURIZATION (FGD) ENVIRONMENTAL ASSESSMENT,

February, 1988

Submitted to:

Environment Ontario, Environmental Assessment Branch

Contents:

1. Major Comments

1.1 Scope

The Environmental Assessment document is extensive and comprehensive within its stated scope and covers topics expected in an EA document (e.g. undertaking, alternatives, description of project(s), environmental effects and mitigation, EA process, etc.). It reflects a substantial level of effort by Ontario Hydro staff and their consultants.

1.2 Purpose

Environment Canada wishes to stress the importance and the responsibility of the purpose of the undertaking (page 2-1) - "to reduce Ontario Hydro's sulphur dioxide (SO_2) emissions from its operating coal-fired generating stations to levels required by Environment Ontario) Regulation 281/87 ...".

This regulation is an important component of the Canadian Acid Rain Control Program, and the associated Canada-Ontario agreement which will help achieve a 50% reduction in SO_2 emissions in Eastern Canada by 1994. It is the proponent's responsibility that the various assumptions and projections in the EA are valid, e.g. future electrical demand, generation capability, transmission capability, time taken to retrofit FGD etc. etc. While flexibility has been requested by the proponent in choosing methods of complying with the Environment Ontario regulation, we suggest there should be no exemption because of invalid assumptions or projections made in the EA document.

1.3 Consultation

Environment Canada was given an opportunity to review a draft of the EA document dated September 1987 (pages 7-2 to 7-5), and provided comments to the proponent. While the proponent did not meet with Environment Canada staff during the Pre-Submission Consultation (PSC) activities, it appears that some of our concerns were considered prior to the formal submission of the final EA document dated February, 1988. However, a number of concerns have not been satisfactorily addressed. The lack of commitment by the proponent to specific mitigation measures in the EA document, is a major concern.

According to Figure 1-1, page 1-1, when Government approval of the EA is received, a Project Implementation Report (PIR) is filed shortly thereafter, and construction appears to begin simultaneously with this PIR filing. It also appears that approval of the EA means

.../2

obviously attractive, even without quantifying the economic benefits of not disrupting the environment for disposal of large volumes of waste. However, even a narrow economic analysis should not only include the initial cost of land (some of which the utility may own), but should also include credible costs for site preparation, seepage control, waste transportation and disposal, runoff control and treatment, site operation and maintenance, reclamation, decommissioning, etc. We suggest that the sole role of the proponent is not "to produce power only", but to do so in an environmentally responsible manner. We also note that fly ash from Ontario Hydro plants is sold to "product markets outside the energy sector". We further suggest that the proponent should not limit their discussions on FGD by-product utilization with only one Ontario gypsum wall board producer.

We caution any premature commitments to other waste utilizations options discussed in the EA document (page 3-18 to 3-20), such as road base fills, soil additives, mine backfills, hazardous waste stabilization, etc. These options should be thoroughly assessed from an environmental perspective, before being allowed.

1.7 Flue Gas Re-Heat

Wet scrubbers will cool the flue gases and result in condensation and higher ground level NO_2 concentrations, acid rainout near stack, and formation of a visible plume which may be aestnetically displeasing and potentially hazardous to ground traffic and air traffic, as noted in the EA document pages 6-10 to 6-13. To mitigate these concerns, the flue gas can be reheated to give the exit gases more bougancy and dispersion.

However, the proponent has "concluded that reheating the flue gas is not an economical approach". The basis and judgement used by the proponent in arriving at this conclusion should be critically and closely examined. As a minimum mitigation measure it appears to be prudent and appropriate to provide flue gas reheat even with a new low-velocity "wet" stack design that incorporates stack liquid separation and a top reducing section for higher stack exit velocities.

1.8 Continuous Emission Monitoring

To provide accurate monitoring of emissions, it is suggested that an in-stack continuous monitoring system be provided for measuring sulphur dioxide, nitrogen oxides and opacity. This is part of the Environment Canada Clean Air Act, Thermal Power Generation Emissions - National Guidelines for New Stationary Sources, Canada Gazette Part II, Vol. 1.4, No. 13, April 25, 1981. A properly selected and maintained continuous emission monitoring system is expected to give more reliable data than calculating emissions from the sulphur content and feed rate of coal.

.../5

1.9 Nitrogen Oxides and Trace Contaminants

The proponent has requested flexibility so that many options are available to them in their planning activities. The FGD Program EA covers a period from 1988 to 2000 and beyond, so the long-term planning should also try to anticipate future likely environmental requirements, and not expect to get approvals in 1988 for all gas control activities and environmental requirements for the next twenty years. Controls on nitrogen oxides and flue gas trace contaminants could be considered, although this should not delay the purpose of the undertaking - i.e. compliance with Ontario Regulation 281/87.

For example space requirements for future Selective Catalytic Reduction (SCR) systems for NO_x removal might be a considered in site layouts (e.g. see Kobayashi, M. et al, "NO_x Reduction - Dry Catalytic Process gives Promising Results", Moderns Power Systems, January 1988). The role of nitrous oxide (N_2O) in global climate change and stratospheric ozone deplection, is receiving attention which is another reaosn to consider NO_x controls, in addition to ground level impacts.

The efficiency of various FGD systems in removing different contaminants (such as mercury) from flue gases, could also be considered as a factor in the selection of FGD systems (e.g. Smith, I.M., "Trace Elements from Coal Combustion Emissions", International Energy Agency, Coal Research, IEA CR (01, June, 1987).

1.10 Fugitive Dust

The commitment and methods to control fugitive dust from FGD reagent and by-product handling, are not well detailed in the EA. It is noted that at some stations the control of fugitive dust from coal and ash has been a local public and regulatory concern in the past so more details of the proponent's intention to mitigate these problems might be reasonably expected in the EA document.

1.11 Conclusions and Recommendations

For this Environmental Assessment of the Ontario Hydro Flue Gas Desulphurization Program, more firm commitments to mitigation measures are suggested.

Specially, environmental concerns can be reduced or eliminated by:

i) having the FGD program consistent with Environment Canada's Environmental Codes of Practice for Steam Electric Power Generation;

ii) giving appropriate weight to environmental factors, and credible economic, commercial and technical factors, when considering FGD by-product gypsum utilization;

.../6

iii) providing flue gas re-heat in wet FGD systems;

iv) providing continuous stack emission monitors;

v) anticipating future water and air quality requirements in long-term planning;

vi) providing detail and commitment to fugitive dust control.

With the experience of over 200 FGD systems operating in the world, it is hoped that the first FGD systems in Canadian electric power plants will be selected, designed, sited, constructed, operated and decommissioned with proper consideration to environmental protection practices.

2. Detailed Comments

2.1 Assessment of Consistency With Environment Canada Design Phase Code of Practice

i) General

In the Program EA it is stated on pg. 2-5 that "The (Environment Canada) Design Phase Codes specifically address FGD systems; these systems will be designed, and appropriate mitigative measures applied, to ensure consistency with these Codes". However, later sections of the EA document fail to commit to following specific recommendations of the code, and in fact appear inconsistent with the Design Phase Code in a number of areas. These are identified in the following.

ii) Applicable Design Phase Code Recommendations

R 205 Closed loop
R 206 Water reuse
R 207 Waste disposal
R 208 Containment
R 209 Containment sizing
R 210 Seepage control
R 211 Effluent limits

R 301 Monitoring facilities access
R 304 Wastewater discharge monitors
R 305 In-plant monitors
R 306 Groundwater monitors
R 307 Pre-operational groundwater monitoring
R 308 Aquatic environment pre-operational monitoring
R 309 Environmental data processing

iii) Consistency With Applicable Recommendations

R 205 PROGRAM EA NOT CONSISTENT WITH THIS RECOMMENDATION

R 205 states that:

(a) systems should be designed for closed loop operation;
(b) treatment and reuse of blowdown would be considered equivalent to closed loop (evaporation is considered a candidate treatment technology);
(c) the foregoing should be done "to the extent practicable".

Although some of the FGD options considered are inherently closed loop, the program EA is not consistent with any of the above aspects of the recommendation in its description of the wet limestone slurry process. For example:

(a) The statement in section 6.1.2.3(b), pg. 6-13, that "Ontario Hydro is recommending a blowdown of 26 000 kg/h to limit chlorides in the process water to a maximum of 20 000 mg/L" indicates that Ontario Hydro does not plan to operate a closed process water loop for the wet limestone slurry process.

(b) The statement by Ontario Hydro in section 6.1.2.3(d), pg. 6-16, that "Since the recommended waste water treatment method (metal precipitation and dilution) meets all MOE Water Quality Objectives and is considered sufficient to protect the environment, the additional cost to evaporate the blowdown is not justified or recommended at this time", indicates that they do not intend to meet the equivalency criterion by treating and reusing blowdown.

(c) The report introduces no detailed technical or economic data, and makes no reference to literature which shows that closed loop operation is not "practicable". It refers, in a general sense, to some technical challenges to closing the loop but fails to make reference to several Environment Canada reports which address these same technical challenges and show that they should not be major impediments to closed loop operation (section 6.1.2.3(d)), pg. 6-16. Examples of such reports are appended to these comments as references 1, 2, and 3. Appropriate reference to these reports would result in a more balanced assessment of the feasibility of closed-loop operation.

R 206 PROGRAM EA NOT CONSISTENT WITH THIS RECOMMENDATION

As indicated above, Ontario Hydro proposes to discharge, and not reuse, FGD blowdown. Also, in Figure 4-2, fly ash is shown to be conditioned with make-up water. In such a system it would be preferable to "blowdown" FGD process water for use in ash conditioning, thus allowing for increased use of fresh water for such uses as mist eliminator washing.

.../8

The report does not contain sufficient detail to allow an assessment of all areas for potential water reuse.

R 207 PROGRAM EA NOT CONSISTENT WITH THIS RECOMMENDATION

Ontario Hydro states in section 4.2.2.5, pg. 4-16, that, "Filtered and dewatered LSDA raw waste is thixotropic in nature and will become sloppy if worked excessively". However, this is followed by the statement that, "Filtered, dewatered waste can be disposed of without further treatment". This is not consistent with R 207 ii), which recommends that all wastes have physical and chemical stability suitable for land reuse.

The statement that "Raw disposal of limestone dual alkali waste is not Ontario Hydro's preferred disposal option", (also in section 4.2.2.5), should be changed to a firm commitment that R 207 ii) will be followed. For example, for the wet limestone slurry process, it is stated in section 4.2.1.4, page. 4-5, that, "In the natural oxidation case, the waste material, which is primarily sulphite, will be fixated by the addition of amounts of fly ash and lime, making it stable".

One alternative which will mitigate all concerns relating to the disposal of solid wastes from wet limestone slurry, and perhaps dual alkali, systems is the utilization of FGD gypsum in wallboard or cement. However, the assessment of the feasibility of doing this, on pg. 3-18, is heavily biased against the utilization option. For example, the proponent refers to the Ontario Research Foundation study (4), prepared for Environment Canada, as indicating that "the general market conditions (supply versus demand) can limit by-product gypsum utilization". They do not however refer to the more important conclusions of the same study which indicate that "It is likely that for a utility the benefication and sale of FGD gypsum to the board and cement manufacturers would be economically preferable to the alternative of disposal. Under favourable circumstances, the sale of FGD gypsum would be a source of direct profit to the utility".

The proponent refers to communication with Canada Gypsum as indicating that "Uncertainty with respect to gypsum production and sales volumes would present a major obstacle to a decision to produce commercial gypsum. They do not however refer to communications with other Ontario gypsum board producers, such as Westroc Industries, which Environment Canada believes would be more receptive to an agreement to utilize FGD gypsum.

The proponent states that "North American electric utility companies like Ontario Hydro usually produce power only and are not accustomed to serving product markets outside the energy sector". What is not stated is that five North American power plants, with a combined capacity of 4500 megawatts, have firm business arrangements to supply

FGD gypsum to wallboard plants (5). Three of these utilization arrangements are currently operational and there are plans for gypsum utilization at an additional nine power plants.

The proponent states that "while selling gypsum would reduce the land requirements for waste disposal, the costs to do so would be between 11 to 75 times the market value of the land saved from waste disposal". This statement is misleading because it uses only one component of disposal costs, i.e. land costs, to give the impression that disposal is far more economical than the sale of gypsum. In fact, land costs are only a very small component of overall disposal costs, which should include costs for disposal site preparation, seepage control, waste transportation, runoff control and treatment, site maintenance, reclamation, labour, interest on capital, etc. Estimates of the cost of land as a percentage of overall gypsum disposal costs range from less than 1 percent (4) to 4 percent (6). The utilization of gypsum may therefore be the more economical alternative.

R 208

The Program EA addresses a number of concerns pertinent to this recommendation, for example:

- the use of a perimeter ditch around a gypsum stack to contain runoff and accidental process water discharge (pgs. 4-9, 6-18, and 6-31)

- the collection and possible treatment of surface runoff from waste disposal areas (pgs. 6-26 and 6-37) and other FGD-related areas (pg. 6-47).

However, the wording used in the EA does not constitute a firm commitment to consistency with the recommendation. Also, there is insufficient detail provided to fully assess this area.

R 209 INSUFFICIENT INFORMATION PROVIDED TO ASSESS CONSISTENCY WITH THIS RECOMMENDATION

R 210 PROGRAM EA NOT CONSISTENT WITH THIS RECOMMENDATION

The Program EA makes repeated reference to the R 210 criteria (pgs. 3-33, 6-18, 6-37 and 6-40), the need for seepage control measures, and alternatives for meeting seepage control criteria. The document however, stops short of making a specific commitment to meet the criteria of R 210. Although in some cases it appears that the criteria will be met by the natural soils, in other cases statements are made which conflict with R 210. Specific comments relating to the three candidate stations are as follows.

The permeability of the surficial deposits in the Lambton region, described in section 5.1.10.2, pg. 5-10, and in section 5.1.11.3, pg. 5-12, is such that any waste disposal site in this area is likely to surpass the criteria of R 210.

For the Nanticoke disposal area the picture is less clear. A number of alternative sites are described on pgs. 3-29 to 3-33. In subsequent sections detailed information relating to site hydrogeology is presented only for the site adjacent to Nanticoke although there is no statement that the alternative sites have been excluded from consideration.

On pg. 3-33 it is stated that at the site adjacent to Nanticoke, the overburden thickness "will likely be adequate to meet the Environment Canada (1985) guideline", i.e. R 210. It is further stated that "In any areas where overburden thickness is a concern the top portion of the clay deposit can be reworked and compacted or clay material imported and recompacted, to reduce bulk hydraulic conductivity to an acceptable level". However, the terminology used does not indicate a commitment to meet the R 210 criteria, i.e. it is not stated that the site "will" meet R 210.

Also, the permeability of the surficial deposits in the Nanticoke area, described in section 5.2.11.3, pg. 5-24, is such that the R 210 criteria may not be met, and in fact it is stated in section 6.3.2.3c, pg. 6-37, that "The relatively thin and potentially fractured silty clay deposits at some location in the vicinity of Nanticoke GS may not satisfy this (the R 210) criterion". However, the mitigative measures proposed in response to this (pg. 6-40) do not commit the proponent to meeting the R 210 criteria, but instead deal with avoiding an "unacceptable impact on water resources". The term "unacceptable" is not defined. A similar approach is seen in section 6.1.2.4 d, pg. 6-19, where it is stated that "Performance standards for the waste disposal facility would address the concentration and volume of contaminant discharge that would be considered acceptable".

Environment Canada has previously commented to Ontario Hydro that use of a performance standards approach as proposed in this document is not appropriate for the design of landfills because of the difficulty of implementing mitigative measures, such as improvements in seepage control, if performance standards can not be met. It is Environment Canada's suggestion that the seepage control criteria of R 210 should be used as minimum design standards for protection of the environment. Performance standards may be used to determine where additional measures are required but should not be used as a substitute for the R 210 seepage control criteria.

In the case of the Lakeview station, insufficient information is provided to assess consistency with R 210.

.../11

R 211 PROGRAM EA NOT CONSISTENT WITH THIS RECOMMENDATION

The Program EA contains no specific commitment to meet the R 211 effluent quality criteria. The estimates of blowdown quality contained in Table 6-7, pg. 6-15, indicate that at least one parameter, iron, will exceed the R 211 criteria. However, statements made on page 6-13 indicate that Ontario Hydro's preferred approach is to dilute blowdown in the condenser cooling water. This approach is inconsistent with the intent of R 211 and the principles of Ontario's MISA program. As indicated in previous comments, this approach is also inconsistent with R 205. The only commitment provided is the statement on pg. 6-13 that "If necessary, Ontario Hydro will install appropriate treatment technology to meet MOE's Water Quality Objectives or regulations". The lack of clarity in the term "if necessary", the fact that MOE's Water Quality Objectives are only guidelines, and the absence of current regulations, make this statement virtually meaningless.

R 301 INSUFFICIENT INFORMATION PROVIDED TO ASSESS CONSISTENCY WITH THIS RECOMMENDATION

R 304 INSUFFICIENT INFORMATION PROVIDED TO ASSESS CONSISTENCY WITH THIS RECOMMENDATION

R 305 INSUFFICIENT INFORMATION PROVIDED TO ASSESS CONSISTENCY WITH THIS RECOMMENDATION

R 306 SUBJECT IS ADDRESSED BUT COMMITMENT IS VAGUE

R 307 APPEARS CONSISTENT WITH RECOMMENDATION BUT DETAIL IS LACKING

R 308 INSUFFICIENT INFORMATION PROVIDED TO ASSESS CONSISTENCY WITH THIS RECOMMENDATION

R 309 INSUFFICIENT INFORMATION PROVIDED TO ASSESS CONSISTENCY WITH THIS RECOMMENDATION

REFERENCES

1. CH2M Hill Ltd., "Technical/Economic Assessment of Closed Process Water Loop Systems for Flue Gas Desulphurization", Prepared for Environment Canada, Unpublished Report No. IP-40, June, 1985.

2. Canviro Consultants Ltd., "An Evaluation of Flue Gas Desulphurization Wastewaer Treatment by Mechanical Evaporation", Prepared for Environment Canada, Unpublished Report No. IP-39, June, 1985.

3. Ross, G., C. Fulton, S. Nutt and P.G. Finlay, "Alternatives for Achieving Closed-Loop Operation in West Limestone Flue Gas Desulphurization (FGD) Systems" Presented at the Joint ASME/IEEE Power Generation Conference, Portland, Oregon, October, 1986.

4. Ontario Research Foundation, "Technical and Economic Feasibility Investigation of Flue Gas Desulphurization By-Product Gypsum Utilization", Prepared for Environment Canada, Unpublished Report. September, 1983.

5. Ellison, W. and E. Hammer, "FGD-Gypsum Use Penetrates US Wallboard Industry", Power, February, 1988.

6. Barrier, J.W., H.L. Fawcett and L.J. Henson, "Economics of Disposal of Lime/Limestone Scrubbing Wastes: Sludge/Flyash Blending and Gypsum Systems", Prepared for U.S. EPA, Report EPA-600/7-79-069, February, 1979.

.../13

2.2 Assessment of Consistency with Environment Canada Siting Phase Code of Practice

Waste Disposal Sites Selection Process:

The Ontario Hydro's Flue Gas Desulphurization (FGD) Program Environmental Assessment document was reviewed to ensure "consistency" with Environment Canada's Siting Phase Environmental Code of Practice for Steam Electric Power Generation (SEPG) The following points are noted:

i) The steps identified in the process very closely parallel those proposed in the Siting Phase Code.

ii) Their site selection process presupposes that the "preferred" site is property continguous or adjacent to the generating station site.

iii) "Exclusion" criteria have been substitute for "avoidance" criteria which may make site selection more arbitrary and final, thus eliminating some reasonably attractive sites early in the selection process.

iv) The arbitrary selection of a 10 m. thickness of clay overburden for any candidate area is noted. The 10 m. thickness criterion has been applied supposedly in other studies in Southern Ontario but these are not indicated. No permeability criteria have been used however.

v) Comparison of all sites with the preferred adjacent site somehow presumes that this preferred site is inherently better. However, if one reviews the advantages and disadvantages associated with various sites given in Table 3-12, all sites have compatible land use while the adjacent site has hydrogeological conditions somewhat worse than all the others.

vi) These site comparisons beg the question of how objectively sites have actually been compared. The Siting Code recommends group decision-making techniques such as Nominal Group or Delphi Process by a multi-disciplinary team to help ensure reliable concensus decisions. Assigning weights and values premature to all sites can remove the tendency towards arbitrary or premature preferred selections.

vii) Overlay mapping, not mentioned in the document, can greatly assist the selection team in their search for preferred sites.

viii) Conspicuous by its absence is much mention of a site for Lakeview. Perhaps Ontario Hydro should include the ultimate disposal land requirements for Lakeview in the selection

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process for Nanticoke. The EA has left the whole question of a Lakeview disposal site to be considered under a separate environmental assessment submission.

ix) Page 3-33 mentions that the site adjacent to Nanticoke station has clay overburden thickness "generally" in the 5-10 m. range. By Ontario Hydro's own selection criteria mentioned above, this area would likely be excluded from further consideration! A more equitable and consistent method of evaluating all potential site areas should be used.

x) Ontario Hydro might have better indicated just exactly who is doing the site selection. Is this an internal Hydro individual or group, or have affected municipalities, landowners and other government departments such as Ontario Ministry of Agriculture and Food been involved?

2.3 Assessment of Consistency with Environment Canada Draft Construction Phase Code of Practice

Environment Canada is developing, in consultation with the provinces and the electric power utilities, a Construction Phase Code of practice for Steam Electric Power Generation. This Code is now in draft form and is expected to be published by December 1988. The following comments relate to the consistency of the program EA with the current draft of the Code.

The Program EA does not provide, nor is it necessarily expected to provide, sufficient detail relating to construction activities to allow a detailed assessment of consistency with each recommendation. However, in general the document provides good coverage of the relevant major areas of environmental concern and corresponding mitigative measures which are addressed in the Code. These include erosion and siltation control, wastewater discharges and spills, dust control, noise control, and aquatic and terrestrial resources protection. These are covered in section 6.1.1 and Table 6.1 of the EA. Environment Canada's major comment in this area is that firm commitments should be made to the mitigative measures discussed. For example, the "potential mitigation measures" listed in Table 6.1 should be listed as measures which will be implemented.

2.4 Other Comments - General

1. Section 5(3) of the Environmental Assessment Act (RSO, 1980, Chapter 140) lists the content requirements of an environmental assessment document. Among the requirements is a need to describe the affected environment, expected effects on the environment and the actions necessary to prevent, change, mitigate or remedy those effects on the environment. This description is to apply to the undertaking, the alternative

methods of carrying out the undertaking and the alternatives to the undertaking. Section 3.1 of the document, "Alternatives to the Undertaking", clearly does not address the above-noted content requirements. Most of the discussion related to the alternatives centres around cost arguments or lead times for project availability. This could be considered an inadequacy of the EA as presently constituted since certain alternatives may be dismissed too early, or without being properly and fairly evaluated.

2. At several places in the document, the proponent states it is seeking approval for design, construction, operation and decommissioning of FGD facilities for the three candidate coal-fired generating stations. "Siting" has been ignored and yet Hydro is also suggesting those sites which it prefers (at least for Lambton and Nanticoke) should be approved as part of the FGD systems. Why isn't siting also mentioned specifically, especially when Hydro has gone to the trouble of outlining a site selection process? Even though decommissioning is mentioned as a specific phase activity for which Hydro is seeking approval, the amount of decommissioning information is scant. Section 6.1.3., "Waste Site Rehabilitation", gives a very general description of some rehabilitation techniques for disposal sites but no mention is made of all related facilities such as the actual plant, piping, reagent handling and storage areas etc. Can we take Ontario Hydro's statement in the 3rd paragraph of Section 6.1.3 to be some kind of commitment to restore FGD waste disposal sites to permit subsequent residential land use or perhaps unrestricted future uses? Rehabilitation is important enough an issue that specific decommissioning plans for each of the three stations should be discussed as opposed to the general manner in which it is handled now.

3. The treatment by the proponent is disappointing with respect to the specific direction of the Ontario Government's Select Committee on the Environment to consider commercial gypsum production (as mentioned on page 3-18). It is discussed and then dropped from further serious consideration, for various reasons. A similar statement appears again on page 7-4, only this time it is qualified by the statement that this consideration of commercial gypsum production should occur "during its (Hydro's) detailed FGD process selection studies". This we assume to be the PIR stage of project development. But for those very reasons discussed in Section 3, such as the vertical integration aspect of the gypsum wallboard industry, discussions with potential wallboard manufacturers should start now, if not sooner. Surely, Canada Gypsum does not speak for the entire industry! It appears that Hydro has little intention of seriously considering any by-product utilization possibilities when one sees Figure 6-10, Waste Management Options. All waste management options are either landfilling or wet gypsum stacks. No waste reduction

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schemes are even considered here as the most desirable means of mitigation. In the Summary, there is only a passing reference to the fact that Hydro will be investigating means of by-product utilization "over the long term".

4. Section 8 of the EA document discusses the Project Implementation Report (PIR) process. Apparently this is the stage where all details of specific projects will be developed so that government agencies and interested parties can comment on the individual projects. At this point though there is no recourse to a hearing - only the possibility of revisions to the project by Hydro or conflict resolution by the Minister of the Environment. Just exactly how government agencies and interested parties become "involved" in the PIR process is unclear. Page 8-3 makes reference to the formation of working groups. However, no details are given as to how these groups are formed nor the means by which input is provided.

   A related concern at the PIR stage is the lack of time given for PIR review - 30 days. Experience has shown that when a document is submitted which discusses only generalities (ie. the program EA document), the public may not provide significant comment. But once the details are known about specific projects through the PIR, there could be a great deal of interest and the 30 days provided for review is wholly inadequate!

5. The modelling of SO_2 and NO_2 ground level concentrations seems to indicate that the loading due to the retrofitted power stations will satisfy current provincial statutes. However, there are insufficient data describing the stack emission characteristics, stack locations, building dimensions, etc., to allow us to make an independent assessment using the ISCST model (Industrial Source Complex Short Term).

6. In general, the proponent has "cleaned up" its presentation from the EA draft on coal preparation-largely by removing much of the earlier (and somewhat misleading) material.

   They do, however, still infer that "coal washing" by conventional means is the only pre combustion sulphur reduction option, and that anything better than the existing technology would require chemical/biological sulphur reduction processes which are far down the road as well as being costly, and/or cumbersome (much time and reactor capacity are required for biological processes). This is still misleading as there are several advanced physical coal cleaning processes in the demonstration and proof of concept testing stage in the U.S. These processes are attractive because they can be "added on" to existing state of the art conventional preparation plants. Though the efficiencies of the various processes are going to be different (depending upon the nature of the coal, pyrite grain size distribution and content etc.), some

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processes appear to be capable of removing 90% or more of the pyritic sulphur at costs which are not unreasonably greater than conventional coal prep costs.

If these processes were used by a coal producer to make a better product however, Ontario Hydro would obviously have to pay more for the coal. This is perhaps why they don't want to acknowledge the existence of something in the mid to near term which could reduce sulphur prior to combustion. It is too easy to dismiss conventional coal cleaning as being at the limit of its effectiveness and to state that chemical/biological processes are too far down the road and too costly.

Thus, without mentioning the possibility of being able to use an advanced physical coal cleaning process, they can infer that "Coal Washing" is not a pre-combustion, sulphur reduction option.

Other Comments - Specific

pg. 1-2 Section 1.2 - Isn't Ontario Hydro also seeking approval for the siting of up to twenty FGD units along with the other stages listed here or will site approval be sought separately?

pg. 2-5 Section 2.5.1 - The above comment also applies to the discussion under the Post-EA Act Approvals discussion. Isn't facility location a consideration as well?

pg 3-2 Table 3-1 - The statement concerning the 2200 MW Lennox G.S. is no longer accurate. At least a portion of this station was recommissioned this winter.

pg. 3-3 Section 3.1.2.2 - We wonder about the reference shown here which supposedly discusses the economic and environmental suitability of further hydroelectric development. "Ontario Hydro, 1982c" discusses the Lambton G.S. FGD system whereas "Ontario Hydro, 1982b" is a 1982 review of the Hydroelectric Generation Development Program.

pg. 3-15 Section 3.2.2 - In the discussion of the cost of various saleable product FGD processes, Ontario Hydro argues that the higher capital costs are a serious disadvantage for plants whose "remaining life is short" and future utilization is uncertain. But, Table 3-9 shows that the FGD system service life at Nanticoke G.S., (probably the most attractive for one of the by-product utilization technologies), is estimated at 21 years!

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pg. 4-2 Table 4-1 - When summarizing the characteristics of candidate FGD processes, why couldn't by-product utilization be added as another parameter? This would help to complete the comparison of the various available processes.

pg. 4-31 Section 4.3.3.1 - In discussing the search for an alternative waste disposal site for Lakeview, the report says the "study" will be in-service by 1992. We assume this should be "site". Also, in addition to Hydro's estimate of 72 hectares needed for FGD waste disposal at (or near) Lakeview G.S., what are the approximate site requirements for ash disposal during the remainder of station life?

pg. 6-4 Table 6-1 - For potential mitigation under aquatic resources, it is mentioned that a clay liner should have a minimum permeability of $5x10^{5}$ cm/s. We believe the authors mean a permeability of at least $5x10^{-5}$ cm/s! It should be noted that consistency with Environment Canada's Design Phase SEPG Code of Practice would require a permeability of $5x10^{-7}$ cm/s for FGD waste lagoons or $1x10^{-6}$ cm/s for dry FGD waste sites.

pg. 6-4 Table 6-1 - As a means of mitigation for terrestrial resources and aquatic resources, some consideration should be given to waste reduction and reuse in this table as well.

pg. 6-9 Section 6.1.2.1 - Contrary to what is stated in the text, Figure 6.5 and not Figure 6.3 indicates truck and train volumes for various reagent delivery scenarios.

pg. 6-32 Section 6.3.2.1 - The statements made about reagent requirements here are confusing. A range of limestone consumption per unit per year is mentioned and this is compared to annual tonnes mined in Ontario in 1984. The document then states approximate lime requirements per unit per year and says this represents much of the limestone now mined. Please explain.

pg. 6-37 Section 6.3.2.3 - The fate of the "several streams of various sizes" on the proposed disposal sites at Nanticoke is unclear. What are Hydro's plans for possible required diversions and what does the local Conservation Authority have to say?

pg. 6-40 Mitigative Actions - The recommended criterion for permeability here should obviously be $5x10^{-7}$ cm/s not $5x10^{7}$ cm/s as stated. Actually the SEPG Design Phase Code recommends a permeability criterion of $1x10^{-6}$ cm/s for dry FGD waste disposal sites.

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pg. 8-3 Section 8.1.1.3 - Mitigation measures during decommissioning do not include only those considerations of waste disposal site rehabilitation, as was noted in the General Comments above. Many other considerations such as future land uses must also be factored in.

pg. 3-15 It is stated that the cost estimates in Fig. 3-4 include all capital and operating costs, such as waste disposal, and credits for the saleable by-products. It is not stated however if the wet limestone system costs are for closed-loop systems. If not, then the cost comparison is biased, since all other systems are at least theoretically closed-loop systems. Costs should be included for treatment and/or reuse of any process water blowdown.

pg. 3-19 A distinction should be made between FGD wastes which contain primarily $CaSO_4$, such as limestone forced oxidation waste, and those which also contain CaO, such as limestone injection wastes. The statement under the heading "Cement Additive" that FGD wastes contain CaO is not correct for the former. The statement that "calcium sulphate would lead to setting problems and long-term deterioration ... in cement" is misleading because this is a normal component of cement.

Under the heading "Soil Additive", it is incorrect to state that most FGD waste could act as a liming agent. Wet limestone system wastes would not normally contain sufficient alkalinity for this.

pg. 4-8 The leachate characteristics presented in Table 4-4 are not representative for a system run with a tight process water loop. Leachate would, at least initially, have characteristics similar to those of the FGD blowdown shown in Table 6-7, pg. 6-15. For example, chloride concentrations would be 15 000 to 20 000 mg/L and not 60 to 120 mg/L as in Table 4-4.

pg. 4-16 We do not agree that it is possible to dispose of unoxidized, predominately sulphite waste "as is" in a stack-type landfill.

pg. 4-27 In contrast to statements made on this page, leachate with a pH of 12.4 to 12.8 (Table 4-15) will generally be toxic.

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pg. 6-4 In Table 6-1 the clay liner permeability figure is missing the negative sign in the exponent. Also, where did this criterion come from? Even if corrected this would not be consistent with the Design Phase Code of Practice.

pg. 6-13 In the first paragraph on "Treatment" the reference to a brine concentrator appears misplaced.

pg. 6-18 The figure for permeability of a seepage control liner is not correctly quoted from the Design Phase Code of Practice.

pg. 6-19 As indicated in the earlier comment re. pg. 4-8, leachate TDS concentrations are likely to be much higher than indicated in paragraph 4.

pg. 6-40 Permeability criteria from the Design Phase Code of Practice is not correctly quoted in "Mitigative Actions".

ANNEX

Summary of Criteria and Recommendations Steam Electric Power Generation Environmental Codes of Practice

- Siting Phase

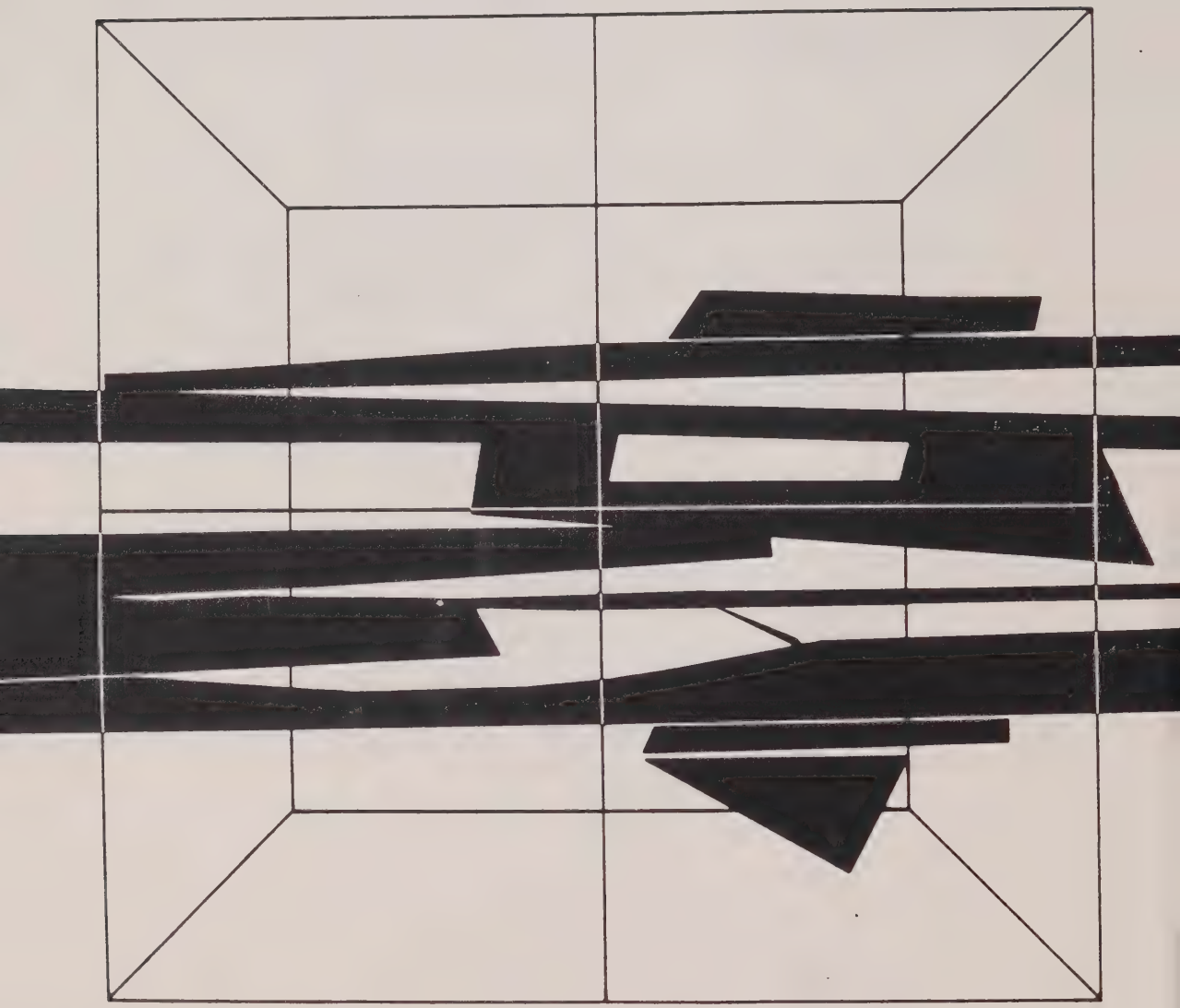
- Design Phase

- Construction Phase, DRAFT

Environmental Codes of Practice for Steam Electric Power Generation

Siting Phase

Report EPS 1 PG 2
March 1987



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Canada

TABLE S.1 SUMMARY OF PHASE I SITE SELECTION CRITERIA (SERIES 100)

Criterion		Application (stations)	Section
Land Use:			
	Agriculture		
C101	- Avoid areas which have prime agricultural capability on a regional scale.	fossil/nuclear	3.1.1
	Forestry		
C102	- Avoid areas within or adjacent to blocks of intensively managed forest lands.	fossil/nuclear	3.1.2
	Recreation		
C103	- Avoid areas adjacent to relatively large designated or formally proposed federal, provincial or regional parks.	fossil/nuclear	3.1.3
Terrestrial Ecology:			
	Dedicated Ecological Lands		
C104	- Avoid all federal, provincial and regional lands dedicated to the protection of flora, fauna and unique, natural, historical and archeological features.	fossil/nuclear	3.2.1
	Wetlands		
C105	- Avoid all large wetlands or wetland complexes in southern Canada.	fossil/nuclear	3.2.2
	Rare and Endangered Species and Critical Wildlife Habitat		
C106	- Avoid all known concentration areas of rare or endangered floral and faunal species, along with a buffer zone appropriate to the sensitivity of the individual species.	fossil/nuclear	3.2.3
C107	- Avoid rare and endangered species habitat, other critical wildlife habitat including wildlife corridors, critical nesting areas and winter ungulate concentration areas along with a buffer zone appropriate to the sensitivity of the species.	fossil/nuclear	3.2.3
Surface Water and Groundwater:			
	Water Quality		
C108	- Avoid areas along shallow lakes.	fossil/nuclear (once-through cooling)	3.3.1
C109	- Avoid areas adjacent to complex broken shorelines or coastlines.	fossil/nuclear (once-through cooling)	3.3.1
C110	- Avoid areas adjacent to lakes or rivers where withdrawal or discharge for the required plant would exceed an acceptable amount of the lake (or closed bay) volume or river flow.	fossil/nuclear (once-through cooling)	3.3.1
C111	- Avoid areas along small lakes or small closed bays.	fossil/nuclear (once-through cooling)	3.3.1

TABLE S.1 SUMMARY OF PHASE I SITE SELECTION CRITERIA (SERIES 100) (Cont'd)

Criterion		Application (stations)	Section
	Groundwater		
C112	- Avoid areas of highly fractured bedrock.	fossil/nuclear	3.3.2
C113	- Avoid areas of thick, highly permeable sands and gravels.	fossil/nuclear	3.3.2
C114	- Avoid areas of major recharge which are upgradient to major groundwater users.	fossil/nuclear	3.3.2
Aquatic Ecology:			
	Major Fisheries and Spawning Grounds		
C115	- Avoid areas near a major fishery or spawning ground.	fossil/nuclear (once-through cooling)	3.4.1
	Unique or Sensitive Aquatic Species		
C116	- Avoid all areas from the portion of water body containing known concentrations of unique or sensitive species.	fossil/nuclear (once-through cooling)	3.4.2
C117	- Avoid areas adjacent to anadromous salmon streams.	fossil/nuclear	3.4.2
	Sensitive Aquatic Environments		
C118	- Avoid areas adjacent to estuaries or coastal wetlands.	fossil/nuclear	3.4.3
	Salt Marshes		
C119	- Avoid all salt marshes and salt marsh complexes.	fossil/nuclear (once-through cooling)	3.4.4
Atmospheric Environment:			
	Officially Designated Areas and International Boundaries		
C120	- Avoid areas close to the boundary of preserved national, provincial or other designated parklands or dedicated and international borders.	fossil only	3.5.1
	Poor Air Quality Areas		
C121	- Avoid areas where existing air quality is near or exceeds national or provincial air quality objectives, criteria and/or regulations.	fossil/nuclear	3.5.2
	Urban Population Centres		
C122	- Avoid locating stations near large urban centres.	fossil/nuclear	3.5.3
	Unfavourable Topographic Areas		
C123	- Avoid areas with poor atmospheric dispersion characteristics due to the influence of terrain features.	fossil/nuclear	3.5.4

TABLE S.2 SUMMARY OF PHASE II SITE SELECTION CRITERIA (SERIES 200)

Criterion		Application (stations)	Section
Land Use:			
	Agriculture		
C201	- Evaluate areas within or adjacent to candidate sites for their agricultural capability and current productivity.	fossil/nuclear	4.1.1
C202	- Evaluate areas surrounding candidate sites for their sensitivity to atmospheric emissions.	fossil/nuclear	4.1.1
	Forestry		
C203	- Evaluate areas in the vicinity of candidate sites for their forestry potential.	fossil/nuclear	4.1.2
C204	- Evaluate areas in the vicinity of candidate sites for their production tree species sensitive to atmospheric emissions.	fossil only	4.1.2
	Recreation		
C205	- Avoid all recreation areas not previously mapped in Phase I.	fossil/nuclear	4.1.3
C206	- Evaluate recreation areas adjacent to candidate sites for their recreation capability and use.	fossil/nuclear	4.1.3
Terrestrial Ecology:			
	Hunting and Trapping		
C207	- Evaluate areas in the vicinity of candidate sites for their level of hunting and trapping activity.	fossil/nuclear	4.2.1
	Dedicated Ecological Lands		
C208	- Avoid all dedicated ecological lands not previously mapped in Phase I along with a buffer that relates to the sensitivity of the resources being protected.	fossil/nuclear	4.2.2
C209	- Evaluate dedicated ecological lands in terms of their proximity to candidate sites and their potential for impacts from emissions and disturbance from ancillary developments.	fossil/nuclear	4.2.2
	Wetlands		
C210	- Evaluate the importance of wetland or wetland complexes close to a candidate site.	fossil/nuclear	4.2.3
	Rare and Endangered Species and Critical Wildlife Habitat		
C211	- Evaluate the proximity of candidate sites to areas containing rare, endangered or regionally-significant species.	fossil/nuclear	4.2.4
C212	- Evaluate the proximity of candidate sites to significant wildlife habitat not previously mapped in Phase I.	fossil/nuclear	4.2.4
Surface Water and Groundwater:			
	Water Quality		
C213	- Evaluate the percentage of minimum mean monthly river flow or percentage of lake (or closed bay) volume required for withdrawal or discharge at a given site.	fossil/nuclear (once-through cooling)	4.3.1

TABLE S.2 SUMMARY OF PHASE II SITE SELECTION CRITERIA (SERIES 200) (Cont'd)

Criterion		Application (stations)	Section
	Water Use Compatability		
C214	- Evaluate the proximity of sites up-stream or up-current to major water supply intakes.	fossil/nuclear	4.3.2
C215	- Evaluate the degree of existing water quality problems associated with a site's receiving water body and the extent to which these would be affected by temperature change and contaminant release.	fossil/nuclear	4.3.2
	Groundwater		
C216	- Evaluate local bedrock and overburden.	fossil/nuclear	4.3.3
C217	- Evaluate groundwater directions and gradients by checking local relief.	fossil/nuclear	4.3.3
C218	- Evaluate available well records and establish groundwater quality.	fossil/nuclear	4.3.3
Aquatic Ecology:			
	Fisheries and Spawning Grounds		
C219	- Evaluate the proximity of sites to fisheries or spawning grounds previously undetected or not mappable on a regional scale.	fossil/nuclear	4.4.1
	Unique or Sensitive Species		
C220	- Evaluate the proximity of sites to areas containing unique, rare, endangered or sensitive aquatic species previously unknown or unmappable at the regional scale.	fossil/nuclear	4.4.2
	Sensitive Aquatic Environments		
C221	- Evaluate the proximity of sites to coastal wetlands and estuaries within zone of influence.	fossil/nuclear	4.4.3
	Loss of Organisms due to Entrainment		
C222	- Evaluate the intake-discharge system required to service a site with respect to its impact on aquatic organisms including fish.	fossil/nuclear	4.4.4
Atmospheric Environment:			
	Air Resources Utilization		
C223	- Examine existing air resources and pollution sources around candidate areas or sites to determine whether the addition of a new power plant will still permit compliance with ambient air quality objectives and/or standards.	fossil/nuclear	4.5.1
	Air Pollution Meteorology		
C224	- Evaluate available meteorological data to determine whether there will be high air pollution potential due to unfavourable meteorological conditions at a candidate site or area.	fossil/nuclear	4.5.2

Environmental Codes of Practice for Steam Electric Power Generation

Design Phase

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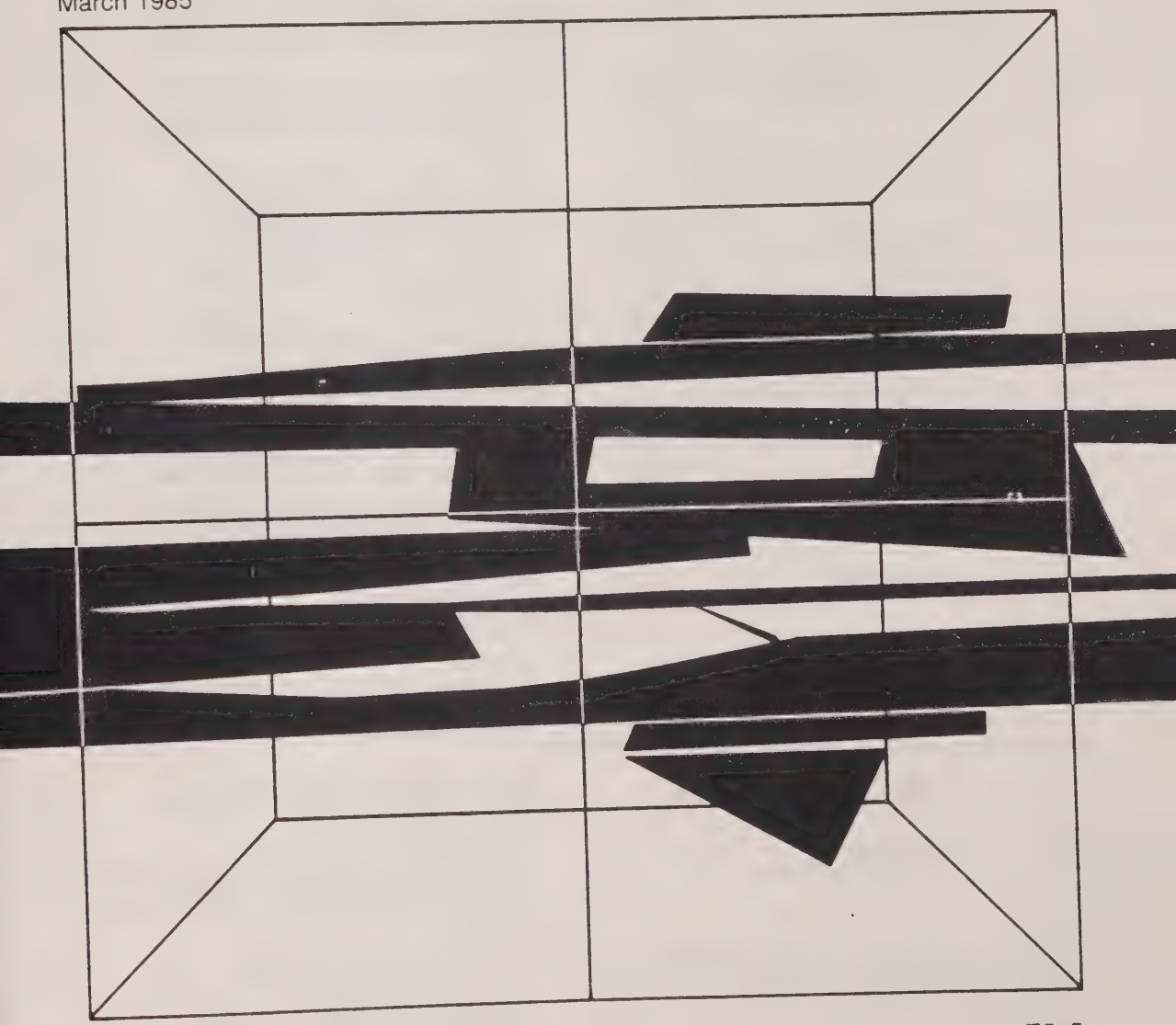
March 1985



Environment Canada
Environmental Protection Service

Environnement Canada
Service de la protection de l'environnement

Canada

TABLE 5.1 SUMMARY OF RECOMMENDATIONS RELATED TO ONCE-THROUGH COOLING WATER (SERIES 100)

NUMBER	SUBJECT	SUMMARY OF RECOMMENDATION	SECTION/ APPENDIX
Minimization of Quantities of Organisms Entrapped and Entrained			
R101	**Total Cooling Water Withdrawal** - Volume Limitations	Design for less than i) 10% of nearshore zone within 50 km reach, ii) 5% of total volume of lake or reservoir, iii) 10% of average river flow, unless better alternatives are demonstrated.	4.1.1.1 D.4.2
R102	**Auxiliary Cooling Water Withdrawal** - Volume Limitations	Design for i) practical minimum water requirements, ii) practicable reuse of discharge, unless better alternatives are demonstrated.	4.1.1.2 D.4.2
R103	**Cooling Water Pumping System** - Flow Control	Consider i) larger number of smaller pumps, ii) flow control valves for pumps or condensers.	4.1.1.3 D.4.2
R104	**Station Outages** - Scheduling (See R113)	Plan outages for periods of maximum concentration of ichthyoplankton (fish eggs and larvae) entrapped in intake, to extent practicable.	4.1.1.4 D.4.2
R105	**Intake Relative to Shore** - Location	Locate intake offshore beyond nearshore littoral zone, unless better alternatives are demonstrated.	4.1.1.5 D.4.3
R106	**Intake Relative to Outfall** - Locations	Locate intake and outfall i) to minimize recirculation of discharge to intake, ii) so that if inland, intake is longer than outfall, unless better alternatives are demonstrated.	4.1.1.6 D.4.3
R107	**Intake Design** - Selection	Select for offshore submerged intake, a horizontal flow velocity cap design, unless better alternatives are demonstrated.	4.1.1.7 D.4.4
R108	**Shoreline Intake** - Location	Locate i) flush with shoreline, ii) in a shoreline area without protrusions or intrusions.	4.1.1.8 D.4.4
R109	**Intake Design** - Fish Bypass and Flow Criteria	Design for i) installed or retrofit fish by-pass/return, ii) horizontal flow less than 15 cm/s.	4.1.1.9 D.4.4
Minimization of Damage to Organisms Entrapped and Entrained			
R110	**Cooling Water Pumps** - Considerations for Selection	Consider probable physical stresses induced on aquatic organisms by alternative types and numbers of pumps	4.1.1.10 D.5.2
R111	**Biofouling Control** - Alternatives/Design	i) Avoid chemical use if possible. ii) If chemical required, minimize applications. iii) Design application rate control system. iv) Limit application to one condenser at a time during day.	4.1.1.11 D.5.3
R112	**Corrosion, Scaling or Silting Control** - Alternatives/Design	i) Avoid chemical use if possible. ii) If chemicals required, select environmentally innocuous types. iii) Design application rate control system. iv) Consider batch cleaning of condensers/heat exchangers and waste treatment.	4.1.1.12 D.5.3

TABLE 5.1 (Cont'd)

NUMBER	SUBJECT	SUMMARY OF RECOMMENDATION	SECTION/ APPENDIX
Minimization of Detrimental Effects of Heated Discharges			
R113	**Condenser Discharge Temperatures** - Criteria	i) Design for 2°C below lethal temperatures of entrained aquatic species. ii) Minimize flow if aquatic species killed because of physical or chemical stresses. iii) Determine annual temperature rule curve to establish maximum allowable seasonal discharge temperatures.	4.1.1.13 D.5.4
R114	**Thermal Plume Zones** - Limitations to Areas of Influence	Design area of influence (1°C isotherm) for less than i) 10% of nearshore zone within 50 km reach in lake, ii) 10% of nearshore zone within 50 km downstream reach in river, iii) 10% of total surface area of lake or reservoir, iv) 50% of distance across river, lake or reservoir, unless better alternatives are demonstrated.	4.1.1.14 D.6.1
R115	**Outfall** - Location and Design	Design for i) offshore location beyond nearshore zone and directed away from shore, ii) a tunneled discharge to outfall, unless better alternatives are demonstrated.	4.1.1.15 D.6.2
R116	**Supplementary Cooling** - Limitations	Do not use "helper" systems to cool thermal discharges, unless it is demonstrated as best alternative.	4.1.1.16 D.6.3

TABLE 5.2 SUMMARY OF RECOMMENDATIONS RELATED TO WASTEWATERS (SERIES 200)

NUMBER	SUBJECT	SUMMARY OF RECOMMENDATION	SECTION/ APPENDIX
Minimization of Contaminants and Wastewater Volumes			
R201	**Evaporative Recirculating Cooling** - Materials of Construction and Chemical Uses	i) Avoid chemical use if possible. ii) Do not use asbestos-based materials in cooling towers. iii) Do not use chromium based compounds in cooling ponds. iv) If chemicals required, design rate control system.	4.2.1.1 E.3.1
R202	**Evaporative Recirculating Cooling** - Design and Operating conditions	Design for i) minimum of two cycles of concentration, ii) so that make-up is through auxiliary coolers, if practicable.	4.2.1.2 E.3.2
R203	**Auxiliary Cooling** - Design	Design for intermediate recirculating loop between once-through cooling water and auxiliary coolers, or use another method to prevent inadvertent contamination.	4.2.1.3 E.3.2
R204	**Ash Handling** - System Selection	Select i) dry fly ash, ii) recirculating bottom ash, unless demonstrated that alternatives will produce less wastewater.	4.2.1.4 E.3.2
R205	**Flue Gas Desulphurization (FGD)** - System Selection/Design	Select system or design system for zero discharge of process wastewater to extent practicable.	4.2.1.5 E.3.2
R206	**Water Reuse** - Design Provisions	If practicable, design for i) reuse of auxiliary cooling discharge, ii) reuse of other wastewaters.	4.2.1.6 E.3.3
R207	**Waste Disposal** - Development and Abandonment	Design ash, FGD and refuse sites for i) modular development during operation, ii) chemical and physical stability suitable for land re-use, iii) site contouring and capping, iv) reclamation prior to abandonment.	4.2.1.7 E.3.4
Containment of Wastewaters and Waste Residues			
R208	**Waste Liquids** - Segregation and Containment	Design for i) containment of all wastewaters, ii) collection of similar wastewaters, iii) separate containments for hazardous wastes, (e.g., PCBs, metal cleaning, radioactive), iv) separate containment for incompatible bulk chemicals.	4.2.1.8 E.4.1
R209	**Containment Facilities** - Sizing Criteria	Design containments for normal volumes of wastewater and i) maximum 24-hour wastewater, ii) maximum spills or leaks, or iii) 100-year 24-hour precipitation event for outside containments.	4.2.1.9 E.4.3a

TABLE 5.2 (Cont'd)

NUMBER	SUBJECT	SUMMARY OF RECOMMENDATION	SECTION/ APPENDIX
R210	**Seepage Control** - Permeability Criteria	Ensure that natural or constructed barriers exist between the bottom of the waste disposal site and the underlying aquifer, with minimum flow resistance equivalent to material 1 metre thick, of the following permeabilities: i) 1×10^{-7} cm/s for high sulphur (> 1% s) coal piles, chemical and radioactive wastes, ii) 5×10^{-7} cm/s for ash and FGD waste lagoons, iii) 1×10^{-6} cm/s for low sulphur coal piles (< 1% s), dry ash* and dry FGD waste sites, iv) 1×10^{-5} cm/s for other areas. * Except for ash disposal in mines	4.2.1.10 E.4.3b
Treatment of Wastewaters Prior to Discharge			
R211	**Discharged Wastewaters** - Effluent Limitations	Design so that wastewaters discharged to once-through cooling or receiving waters do not exceed following concentrations: pH 6.5 to 9.5 Fe 1.0 mg/L Cr, Cu, Ni, Zn 0.5 mg/L Cr(hexa) 0.05 mg/L TSS 25 mg/L Oil and Grease 15 mg/L TRC 0.2 mg/L	4.2.1.11 E.5.5
R212	**Radioactive Wastewaters** - Management	Consider radioactive wastewater treatment alternatives to further minimize discharge of radionuclides to once-through cooling or receiving waters.	4.2.1.12 E.5.6
R213	**Sanitary Wastewaters** - Treatment	Design for i) segregation from other wastewaters, ii) secondary biological treatment if not directed to a municipal treatment plant.	4.2.1.13 E.5.7

TABLE 5.3 SUMMARY OF RECOMMENDATIONS RELATED TO MONITORING (SERIES 300)

NUMBER	SUBJECT	SUMMARY OF RECOMMENDATION	SECTION/ APPENDIX
R301	Monitoring Facilities - Access	Design so that they can be safely accessed and used.	4.3.1.1 F.1
R302	Once-Through Cooling - Continuous Monitors	Provide for i) continuous flow and temperature monitors and grab sampling of once-through cooling and auxiliary cooling streams, ii) TRC readings at condenser and heat exchangers outlets, if chlorine used.	4.3.1.2 F.2.2
R303	Once-Through Cooling - Periodic Monitoring	Provide for periodic biological sampling of cooling water forebay and discharge, and fish by-pass.	4.3.1.3 F.2.2
R304	Discharged Wastewaters - Monitors	Provide for i) representative sampling, ii) integrated flow monitors (±10% accuracy), iii) on-line pH, TRC or other monitors.	4.3.1.4 F.3.2
R305	Inplant Waters - Monitoring Considerations	Consider flow monitors and sampling facilities for in-plant water streams.	4.3.1.5 F.3.2
R306	Groundwaters - Monitors	Provide permanent piezometer/well system at coal storage and waste disposal sites.	4.3.1.6 F.4.2
R307	Groundwaters - Pre-operational Monitoring	Conduct pre-operational monitoring starting at least one year before construction.	4.3.1.7 F.4.2
R308	Aquatic Environment - Pre-operational Monitoring	Conduct pre-operational monitoring starting at least one year before construction to determine baseline data for biota, water quality and sediment.	4.3.1.8 F.5.3
R309	Environmental Data - Processing	Provide appropriate facilities for analyses, alarms, and data storage and retrieval.	4.3.1.9 F.6.2

ENVIRONMENTAL CODES OF PRACTICE FOR STEAM ELECTRIC POWER GENERATION

CONSTRUCTION PHASE

DRAFT
JAN, 1988
Issued for General Review

TABLE 5 SUMMARY OF RECOMMENDATIONS

NUMBER	SUBJECT	SUMMARY OF RECOMMENDATION	SECTION
401	**Erosion and Siltation Control** - Scheduling of Construction	Where practicable restrict use of high bearing pressure equipment when the terrain has low bearing capacity.	4.1.1
402	**Erosion and Siltation Control** - Clearing Practices	i) minimize cleared area, ii) leave buffer zones between cleared areas and water bodies wherever possible iii) minimize time between clearing and development.	4.1.2
403	**Erosion and Siltation Control** - Grubbing Practices	Avoid grubbing near standing timber.	4.1.3
404	**Erosion and Siltation Control** - Roadbuilding	i) where possible provide buffer zones between roads and water bodies ii) design road grades to limit erosion.	4.1.4
405	**Erosion and Siltation Control** - Stripping, grading and excavation	For areas which have been stripped, graded or excavated: i) minimize the extent and duration of exposure, ii) where practicable save topsoil for use on revegetated areas, iii) immediately apply erosion control measures to exposed areas.	4.1.5
406	**Erosion and Siltation Control** - Surface Drainage Management	i) prepare a site erosion and sediment control plan prior to construction, ii) divert drainage from cleared areas, iii) direct runoff to siltation basins prior to discharge, iv) where possible make drainage facilities operational before other construction begins. v) provide siltation facilities: a) to contain precipitation from a 1 in 100 yr., 24-hr. storm b) to have effluent quality less than 25 mg/L TSS.	4.1.6
407	**Erosion and Siltation Control** - Dredging and In-Water Construction	For dredging and in-water construction: i) minimize duration of activity, ii) minimize mixing of sediments with water column, iii) where practicable use tunnelling, not cut and cover for offshore intakes and discharges iv) at on-shore dredge spoil disposal areas and shoreline alterations protect against sedimentation of water body. v) at stream crossings minimize the suspension of sediments.	4.1.7

DRAFT ONLY

TABLE 5 SUMMARY OF RECOMMENDATIONS (Cont'd)

161

NUMBER	SUBJECT	SUMMARY OF RECOMMENDATION	SECT
408	**Wastewater Discharges and Spills** - Wastewater Minimization	Minimize water use and practice wastewater reuse and recycling where practicable.	4.2.1
409	**Wastewater Discharges and Spills** - Wastewater Treatment	i) Manage all wastewater discharges to meet the following criteria prior to release to cooling water, a municipal sewer or receiving water: pH 6.5 to 9.5 Fe 1.0 mg/L Cr, Cu, Ni, Zn 0.5 mg/L Cr (hexa) 0.05 mg/L TSS 25.0 mg/L Oil and Grease 15.0 mg/L TRC 0.2 mg/L ii) Provide secondary biological treatment for sanitary wastewaters. iii) Treat hazardous wastewaters at licensed off-site facilities if they cannot be treated on site.	4.2.2
410	**Wastewater Discharges and Spills** - Spill Control Planning and Procedures	Formally assign responsibility to designated person(s) to: i) develop procedures for handling and storage of oil, fuel and chemicals ii) develop a spill response plan, iii) ensure that contractors are aware of spill control procedures, iv) inspect facilities and check adherence to spill control procedures, v) train personnel in response to spills, vi) maintain access to equipment for dealing with spill, vii) act as point of contact in case of a spill.	4.2.3
411	**Wastewater Discharges and Spills** - Oil, Fuel, and Chemical Storage	Sites designated for the bulk storage and transfer of oil, fuel and chemicals should be: i) located on low permeability material ii) constructed to contain spills, iii) located to minimize possibility of spills entering a watercourse, iv) protected from physical damage.	4.2.
412	**Wastewater Discharges and Spills** - Refuelling	Refuel equipment so that the possibility of spills entering a watercourse is minimized.	4.2.

TABLE 5 SUMMARY OF RECOMMENDATIONS (Cont'd)

NUMBER	SUBJECT	SUMMARY OF RECOMMENDATION	SECTION
413	**Solid Waste Disposal** - Management of Solid Wastes	Solid wastes should not be placed in or come in contact with a water body.	4.3.1
414	**Solid Waste Disposal** - Location and Construction of Disposal Sites	In locating and constructing solid waste disposal sites ensure that: i) disposal site locations are identified on the site plan, ii) sites are at least 100 m from a watercourse unless equivalent protection is provided, iii) site drainage is diverted around the landfill, iv) sites are hidden from view from roads, trails and watercourses, v) sites are suitable for beneficial uses after closure.	4.3.2
415	**Solid Waste Disposal** - Seepage Control Criteria for Disposal Sites	Prior to disposal of solid wastes, ensure that barriers exist between the bottom of the disposal site and the underlying aquifer with minimum flow resistance equivalent to material 1 metre thick of the following permeabilities: i) 5×10^{-7} cm/s for land-disposed dredged spoil, ash and FGD waste lagoons, and process and commissioning sludges, ii) 1×10^{-6} cm/s for dry ash and dry FGD waste, iii) 1×10^{-5} cm/s for domestic refuse and other solid wastes.	4.3.3
416	**Solid Waste Disposal** - Management of Disposal Sites	Manage solid waste disposal sites so that: i) liquid and hazardous wastes are disposed of only in facilities designed, approved and licensed for that purpose, ii) solid wastes are segregated and recycled where practicable, iii) landfill sites are developed in cells, compacted, covered, contoured and capped.	4.3.4
417	**Solid Waste Disposal** - Management of Disposal Sites	Manage waste disposal sites so that: i) access is controlled and disposal activities supervised, ii) records are kept of types and amounts of wastes disposed, iii) rodents, birds, and pests are controlled, iv) drainage is monitored and treated where appropriate.	4.3.4

TABLE 5 SUMMARY OF RECOMMENDATIONS (Cont'd)

NUMBER	SUBJECT	SUMMARY OF RECOMMENDATION	SECTI
418	**Air Pollution Control** - Dust Control	Take all reasonable measures to control fugitive dust from: i) vehicle traffic in unpaved areas, ii) drilling, blasting and excavating, iii) coal transfer and storage facilities, iv) coal ash handling and disposal facilities, v) other significant sources of fugitive dust.	4.4.1
419	**Air Pollution Control** - Emissions from Combustion Sources	Ensure that combustion sources comply with applicable air emission and air quality regulations and requirements.	4.4.2
420	**Air Pollution Control** - Odour Control	Schedule domestic refuse pickup and disposal regularly to avoid odours.	4.4.3
421	**Noise Control** - Intensity Limitations	Noise levels in adjacent residential areas should not normally exceed: i) 55 dBA during day and evening, ii) 50 dBA at night and on holidays.	4.5.1
422	**Noise Control** - Scheduling of Activities	Where possible inform local residents of abnormal noise causing activities and schedule these to minimize disruption.	4.5.1
423	**Terrestrial and Aquatic Life Protection** - Terrestrial Life Protection	To protect wildlife: i) schedule activities to avoid migration and breeding, ii) prohibit on-site use of firearms, iii) avoid procedures or devices which endanger wildlife or prevent migration, iv) restrict access to wetlands, v) leave trees standing where possible.	4.6.1
424	**Terrestrial and Aquatic Life Protection** - Aquatic Life Protection	To protect aquatic life: i) schedule in-water construction to avoid fish spawning and migration where possible, ii) do not impede fish migration by modification of water courses, iii) clear spoil and debris and replace original contours at submerged structures, iv) give notice before in-water blasting, v) control underwater blasting to reduce fish mortality, vi) monitor fish mortality from underwater blasting.	4.6.2

TABLE 5 SUMMARY OF RECOMMENDATIONS (Cont'd)

NUMBER	SUBJECT	SUMMARY OF RECOMMENDATION	SECTION
425	**Archeological and Historical Resource Protection** - Surveys and Finds	To protect archeological or historical resources: i) conduct a survey of site archeological resources prior to construction, ii) identify and protect important resources within the site from damage, iii) stop work and consult experts when artifacts or features are encountered.	4.7
426	**Construction Contracts** - Environmental Requirements	Include appropriate environmental regulations and this Construction Code in major construction contracts.	4.8
427	**Environmental Audits** - Utility Management Information	Conduct periodic internal environmental audits to ensure compliance with all applicable environmental protection requirements.	4.9
428	**Monitoring and Reporting** - Regulatory Agencies	Report, as required, relevant environmental data and information to appropriate regulatory agencies.	4.10

GO TRANSIT

555 Wilson Avenue, Downsview, Ontario, Canada M3H 5Y6
(416) 630-5220 Telex 06-217508 Fax (416) 630-2083

5 April 1988

Mr. B.R. Ward
Director
Environmental Assessment Branch
7th Floor
135 St. Clair Avenue West
Toronto, Ontario
M4V 1P5

Dear Mr. Ward:

Re: Ontario Hydro - Environmental Assessement Flue Gas Desulphurization Program

Thank you for providing GO Transit with a copy of the E.A. for the above noted project. As I am sure you can appreciate, GO Transit's expertise lies primarily in transportation planning and operations and we are therefore unable to comment on the technical aspects of this proposal.

While our quick overview of this document did not reveal any concerns relating to general compliance with legislation and regulations, public information process or overall approach to the examination of alternatives, a more rigorous assessment was not possible due to a present shortage of staff qualified in the area of the E.A. review process.

If you have any questions or concerns relating to our position, please contact me at the above number.

Sincerely,

R.D. Boyle
Manager
Corporate Planning

March 29, 1988

Wes Green
Review Coordinator
Enviornmental Assessment Branch

Dear Mr. Green:

Re: Flue Gas Desulphurization Program EA

This is in response to your request for comments on the above noted document.

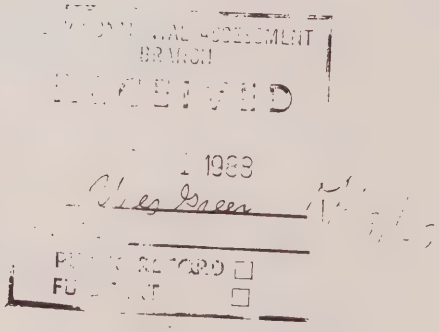
Please be advised that this department has no comments on the EA as it does not directly effect our mandate.

Thanks for your time and the opportunity to participate.

Sincerely,

John Higham

John Higham
Manager
Environmental Planning
Lands, Revenues and Trusts
Ontario Region



Canada

Ontario

Niagara Escarpment Commission
Commission de l'escarpement du Niagara

232 Guelph Street
Georgetown, Ontario
L7G 4B1
(416) 877-5191

232, rue Guelph
Georgetown, Ontario
L7G 4B1
(416) 877-5191

March 28, 1988

Mr. Wes Green
Environmental Assessment Branch
Ministry of the Environment
7th Floor
135 St. Clair Avenue West
Suite 100
Toronto, Ontario
M4V 1P5

Dear Mr. Green:

Re: Ontario Hydro Flue Gas Desulphurization Program Environmental Assessment
OH-GE-02

The Niagara Escarpment Commission considered this program Environmental Assessment at its meeting of March 10, 1988, and adopted the following resolution:

The Ministry of the Environment should be informed that the N.E.C. has reviewed Ontario Hydro's Flue Gas Desulphurization Program Environmental Assessment (OH-GE-02) and finds it complete and appropriately detailed, and adequate from an Escarpment perspective.

With respect to the undertaking, the Commission does not foresee any conflicts with the Niagara Escarpment Plan or the Niagara Escarpment Programme.

Enclosed is a copy of the staff report for your information.

Please replace Ivor McMullin's name and title with mine.

Yours very truly,

C. A. Louis
Manager
Plan Administration

encl.

SUB # 5987

Ontario

Niagara Escarpment Commission
Commission de l'escarpement du Niagara

232 Guelph Street
Georgetown, Ontario
L7G 4B1
(416) 877-5191

232, rue Guelph
Georgetown, Ontario
L7G 4B1
(416) 877-5191

March 10, 1988

Re: Ontario Hydro Flue Gas Desulphurization (FGD) Program Environmental Assessment OH-GE-02

Date Received: February 15, 1988.

Source: Ministry of the Environment.

Proposal: To obtain necessary approval under the Environmental Assessment Act for a program to install flue gass desulphurization technologies (scrubbers) on up to 20 generating units at the Lakeview, Lambton and Nanticoke generating stations. The retrofitted units would come into service over the period 1994-2010.

If approved the program assessment would enable Ontario Hydro to install any of four technologies at any of the three generating stations subject to approval of individual project implementation reports. The project implementation process has provision for Ministry review.

An amendment procedure is set up to incorporate any new technologies, additional generating stations and new waste management options. This procedure includes Ministry review and the possiblity of a "bump-up" to an individual environmental assessment if warranted.

Summary Recommendation: No objection to the environmental assessment or the undertaking.

Background: A draft copy of the environmental assessment document was circulated by Ontario Hydro to the Commision for review and comment in September 1987. The Commission subsequently advised Ontario Hydro that it did not foresee any conflicts with the Niagara Escarpment programme at that time.

Comment: Ontario Hydro has completed the environmental assessment document for its Flue Gas Desulphurization Program and has submitted it to the Ministry of the Environment for approval. The Ministry is undertaking a review of the document and has sought the Commission's comments. The Ministry has submitted a number of questions for this purpose.

As far as the Escarpment programme is concerned; the assessment document raises no new issues. The construction and operation of the Flue Gas Desulphurization technologies at the three generating stations will have no direct environmental effects upon the Escarpment. The only issue which may impact on the Escarpment in the future is the search for a landfill site for waste material from the Lakeview Generating Station; but this will be the subject of a separate environmental assessment.

In seeking the Commission's comments, the Ministry of the Environment posed a number of questions. Our responses follow.

1. **Are the data, analyses and conclusions in the E.A. satisfactory?**
   We think that the scope of the work and the level of detail are adequate. The conclusions reached appear logical and traceable. In addition, the quality of the work is exceptional.

2. **Has the proponent chosen an appropriate range of alternatives to investigate?**
   We think that the range of alternatives investigated with respect to ways to meet the emission standard, the selection of possible flue gas desulphurization technologies, and the options for waste management are appropriate.

3. **Are the monitoring and contingency plans adequate?**
   The proposed monitoring and contingency plans to be put in place during construction and operation seem to be appropriate.

4. **Is the way the proponent intends to implement the undertaking satisfactory?**
   Ontario Hydro proposes to prepare a project implementation report and obtain its approval before construction begins at each site (See Figure 8-1). Also, a procedure is proposed to incorporate amendments to the program assessment (see figure 9-1). We think that these measures are appropriate.

5. **Has the proponent clearly indicated how compliance-reporting regarding commitments in the E.A. related to the Commission's mandate will be fulfilled?**
   There are no specific commitments bearing upon the Commission's mandate. Possible future concerns regarding new landfill facilities to serve the Lakeview Generating Station will be the subject of a separate environmental assessment. The notification and review features of the project implementation process and amendment process are adequate.

6. **Were the Commission's interests given suitable importance?**
   Yes.

7. **What role did the Commission play in pre-submision consultation and were we satisfied?**
   The Commission was circulated the Draft Environmental Assessment and given the chance to comment on it. In the circumstances, this level of involvement was satisfactory.

Recommendation: The Ministry of the Environment should be informed that the N.E.C. has reviewed Ontario Hydro's Flue Gas Desulphurization Program Environmental Assessment (OH-GE-02) and finds it complete and appropriately detailed, and adequate from an Escarpment perspective.

With respect to the undertaking, the Commision does not foresee any conflicts with the Niagara Escarpment Plan or the Niagara Escarpment Programme.

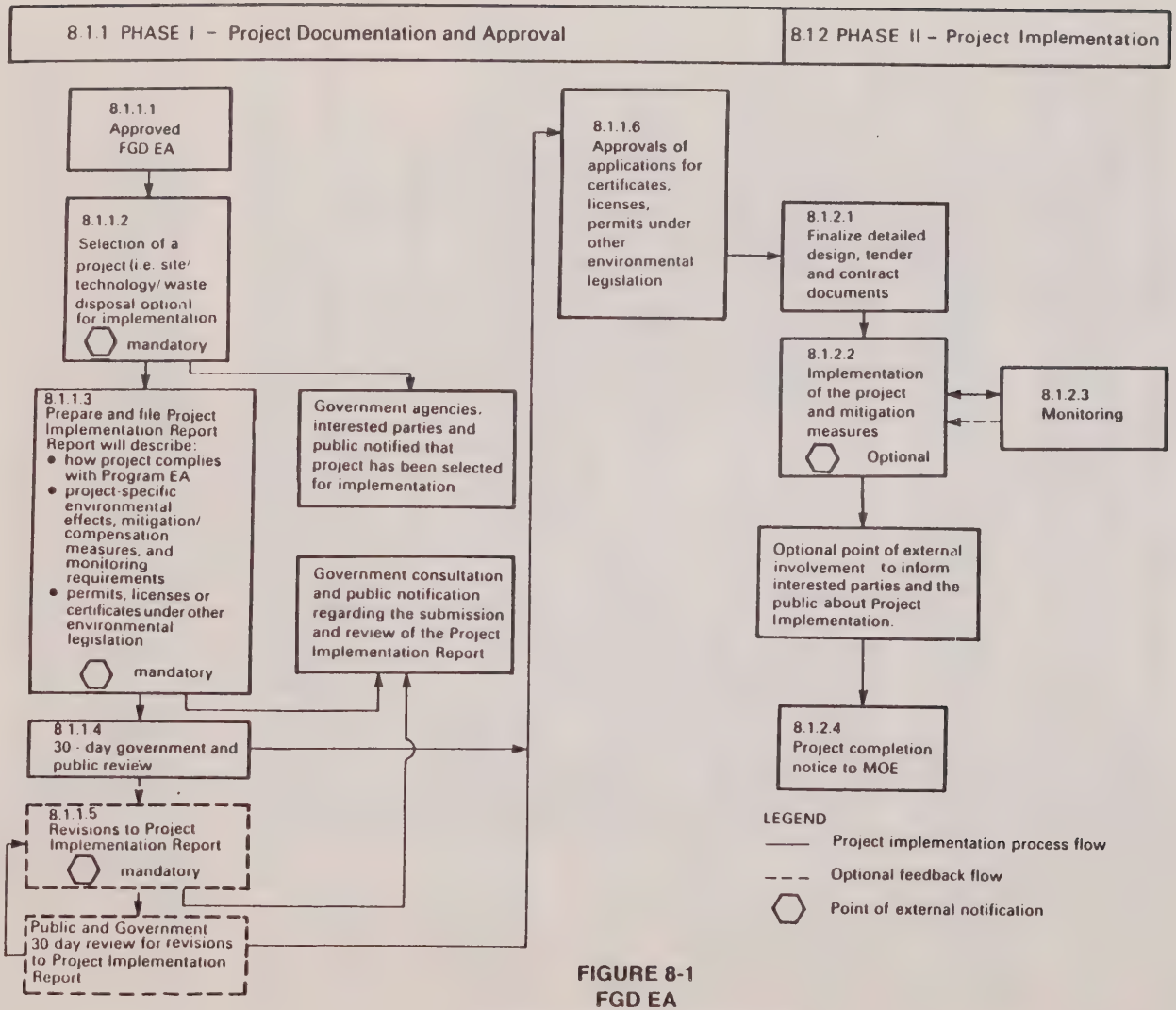


FIGURE 8-1
FGD EA
Project Implementation Process

03801

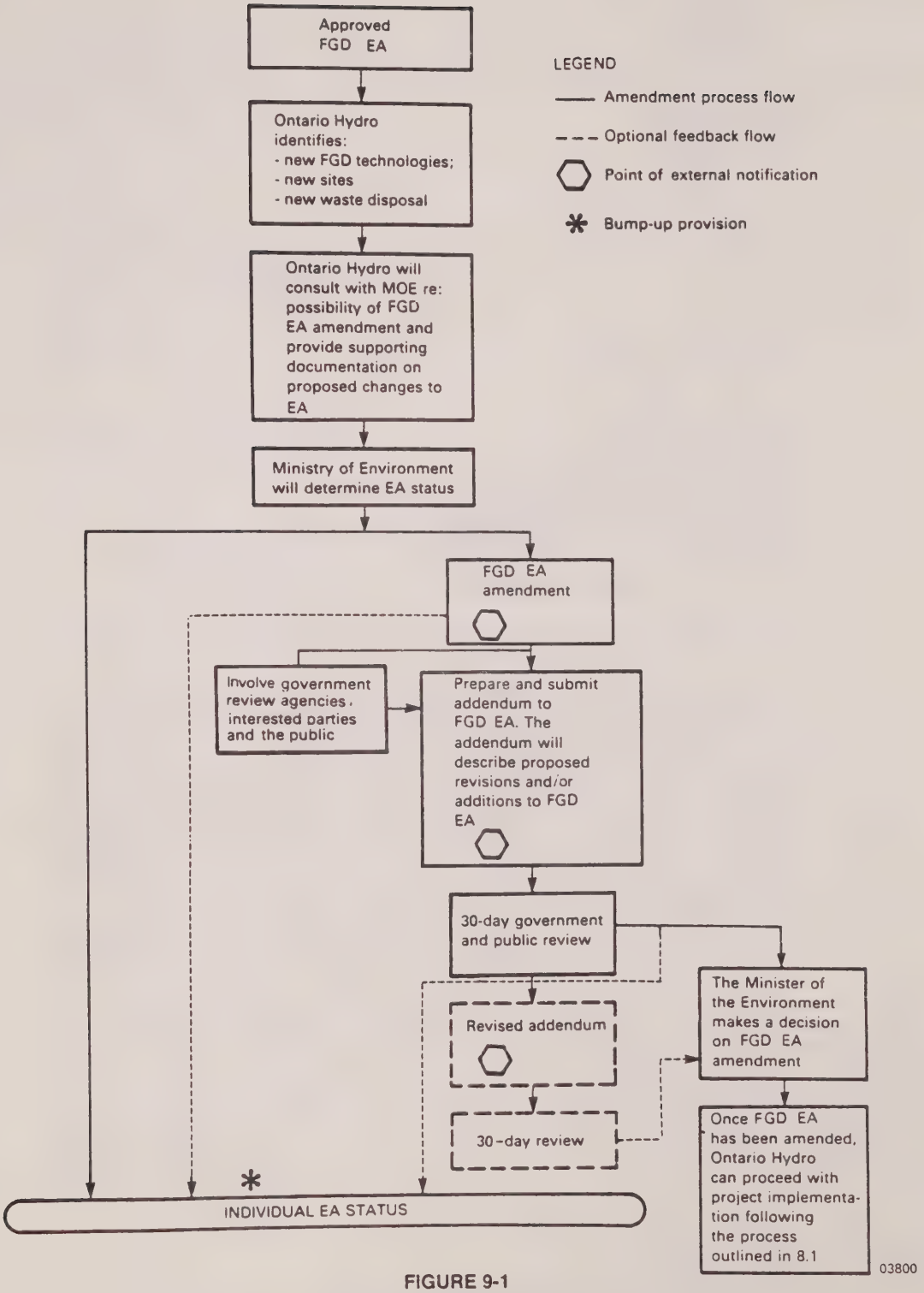


FIGURE 9-1
FGD EA Amendment Process

Ontario

Ontario
Native Affairs
Directorate

Direction générale des
affaires autochtones
de l'Ontario

416/965-4827

NA 731

18 King Street East
3rd Floor
Toronto, Ontario
M5C 1C5

18 rue King, est
3e étage
Toronto, Ontario
M5C 1C5

March 28, 1988

Mr. Wes Green
Review Coordinator
Environmental Assessment Branch
Ministry of the Environment
135 St. Clair Avenue West
Suite 100
Toronto, Ontario M4V 1P5

Dear Mr. Green:

Thank you for your letter of February 12, 1988 regarding the Ontario Hydro Environmental Assessment Flue Gas Desulphurization Program.

Given the proximity of the Six Nations and New Credit Indian Reserves to the Nanticoke Generating Station and the proximity of the Sarnia and Walpole Island Indian Reserves to the Lambton Generating Station, the Directorate would like to see Ontario Hydro place some emphasis on developing an employment equity program for Native people. Since the Indian Reserves noted above are within commuting distance of the generating stations, Ontario Hydro could contact the Chiefs and Band Councils of those Indian Reserves to determine the potential labour force that could be available from those communities.

Thank you for the opportunity to review the above document.

Yours truly,

Mark Krasnick
Executive Director

Transport Canada
Transports Canada

Airports Authority Group
Groupe de gestion des aéroports

4900 Yonge Street
Suite 300
Willowdale, Ontario
M2N 6A5

Your file Votre référence

Our file Notre référence
5150-3 (PKTX)

March 22, 1988

Ministry of the Environment
Environmental Assessment Branch
135 St. Clair Avenue West
Suite 100
Toronto, Ontario
M4V 1P5

Attention: Mr. Wes Green
Review Co-ordinator

Dear Sir:

RE: ONTARIO HYDRO - ENVIRONMENTAL ASSESSMENT
FLUE GAS DESULFURIZATION (FGD) PROGRAM
EA FILE OH-GE-02

In response to your letter of February 12, 1988, a review has now been completed for the above-noted Environmental Assessment.

Of particular concern to this Department is the development of stacks at the proposed sites. It is the responsibility of Transport Canada to assess individual structures to determine if they constitute a hazard to air navigation and thus require marking and/or lighting in accordance with standards set out in our publication, "Standards Obstruction Markings - TP 382E". The stacks at the three sites, identified in Table 5.1 of the assessment document, will be obstructions to aviation and should be marked accordingly.

The stacks at the Lambton and Nanticoke sites, having heights above-ground in excess of 150m (500') shall be lighted with high intensity flashing obstruction lights as per TP 382E, Chapter 7.

The stacks at the Lakeview site shall be lighted with either red obstruction lighting systems as per TP 382E, Chapter 5, or with medium intensity white flashing omni-directional obstruction lights as per Chapter 6. Where medium intensity white flashing obstruction lights are operated 24 hours a day, no painting is required. Where red obstruction lighting systems are used, the stacks are required to be painted with bands of international orange and white, as per Chapter 3. We recommend that use of medium intensity white flashing lights for the Lakeview site.

.../2

Canada

Copies of the appropriate sections of the Standards Obstruction Markings document can be made available to the proponent upon request.

Overall, we are satisfied with the quality of the assessment. Three general areas of concern are outlined below. Note that these points are provided for interest only and are not to be construed as our formal position on this matter.

A) It is unclear as to whether any formal methods or techniques were used to predict environmental effects.

B) Monitoring would appear to be an important component in this type of project. It may be appropriate to provide details regarding the proposed types of monitoring as indicated in 8.1.2.3.

C) It is questionable whether or not the proponent has adequately addressed the requirements of Section 5(3)(d) of the Environmental Assessment Act, particularly as it relates to alternative methods of carrying out and alternatives to the undertaking.

Our participation in the review process is appreciated.

Yours truly,

Robert Lane

R.D. Lane
Regional Manager
Professional and Technical Services

APPENDIX B

ONTARIO HYDRO RESPONSES TO AGENCY CONCERNS

✓ included with OH/July 24 Letter

700 University Avenue, Toronto, Ontario M5G 1X6

July 14, 1988

File No.: 962-FGD-00540-T5

Mr. Donald Dunn
Director,
Foodland Preservation Branch,
Ontario Ministry of Agriculture and Food,
Queen's Park,
Toronto, Ontario
M7A 2B2

Dear Mr. Dunn:

Thank you for the time and effort you and your staff have invested in reviewing Ontario Hydro's Flue Gas Desulphurization Environmental Assessment. Attached is a copy of the minutes of a meeting held with T. Tosine to address concerns with the EA expressed by your branch. We appreciate your concerns and hope that our meeting provided a more detailed and better understanding of the proposed Flue Gas Desulphurization Program and how it will be implemented.

Ontario Hydro feels that many of your concerns relating to consideration of non-landfill waste utilization options will be dealt with during the Project Implementation Phase. As part of the approval being sought under the EA Act, Ontario Hydro is required to file a Project Implementation Report (PIR) with MOE before any construction activity can begin. Government (including OMAF) and public involvement in the PIR process is **implicit** in the process as defined in Chapter 8 of the EA. Permits and approvals under other relevant legislation (eg., Environmental Protection Act) will also be required. We feel that there will be ample opportunity for OMAF to review our detailed proposals for each project installed and waste site design and rehabilitation.

As discussed at the meeting, it is to Hydro's advantage to use the FGD waste, where practical, and avoid landfill. During the PIR phase, we will actively pursue such alternatives. The EA document lists a number of re-use alternatives (Section 3.2.3) which we have and will continue to consider and assess. For example, Hydro has undertaken studies at Lambton and Nanticoke to assess the feasibility of producing wallboard-quality gypsum. Another study is looking at the Wellman-Lord technology and the feasibility of sulhpuric acid production. These studies will be available in support of our decision to commit our first FGD units. Ontario Hydro does not feel that it is necessary to rank these waste management alternatives at this time. We may choose to use a combination of options. Our choice will likely be dictated by the "opportunity" available to us and not where it ranks in a list of options. At this time, however, we cannot guarantee that our attempts to utilize the FGD by-products will be successful. A great deal of study and negotiation will be required to bring many of the alternatives to fulfillment.

Therefore landfill must be retained as a fall back contingency to ensure reliable operation of the FGD systems. The flexibility built into this EA process should allow us to utilize the most economic and environmentally acceptable options at any point in time.

Where practical, Ontario Hydro will commit to using non-agricultural land in the initial waste disposal, and, if necessary, develop any portion of the proposed disposal site on agricultural land last. It is worth noting that of the total 400 ha proposed for landfill disposal at Nanicoke and Lambton, only 58 ha is designated for agricultural use.

With respect to the viability of alternate uses of the property after site rehabilitation, I have enclosed a copy of the report entitled "Flue Gas Desulphurization Waste Disposal Alternatives and Site Rehabilitation". This document details FGD waste use alternatives and site re-use alternatives.

Based on an initial conservative estimate, Ontario Hydro expects that for most uses at least half of the proposed waste disposal areas would be available for redevelopment after site closure and rehabilitation. This assumes that the disposal sites are discrete, each with a buffer zone surrounding it. Should the existing ash disposal areas and the proposed FGD waste sites be developed and closed as one contiguous site, considerably larger areas would be developable.

I hope that this discussion, together with the attached minutes, adequately responds to your concerns. Please indicate, in writing, your concurrence with the minutes. I will then forward the minutes to W. Green, MOE's FGD EA coordinator, for his consideration in preparing the official EA review expected to be issued in July, 1988.

Your early attention to this matter would be appreciated. If you have any additional problems, please contact Diane Barker (592-8591) or myself (592-6007) as soon as possible.

W.M. Paterson
FGD EA Coordinator
Environmental Studies & Assessments
Environmental Planning & Assessments Department

Attachments

cc: T. Tosine OMAF
W. Green MOE

minutes of meeting

attended by

Tonu Tosine OMAF
Murray Paterson H10 G03
Diane Barker H10 G04

cc W. Green MOE
G. Ezers H18 A15

circ. W.R. Effer/R.J. Malvern/C.W. Dawson/
W.M. Paterson/D.E. Barker

date: May 18, 1988

file reference: 962-FGD-00540-T3

subject

MINUTES OF MEETING
FGD EA--RESPONSE TO OMAF COMMENTS/CONCERNS

summary of minutes

The purpose of the meeting was to give Ontario Hydro the opportunity to provide further information on developments regarding the EA, and to deal with, and hopefully to alleviate, concerns expressed by OMAF in their review of the FGD EA (letter D.Dunn to B. Ward, March 31, 1988). Main areas of concern to OMAF are use of landfill as the method of disposal for the FGD waste and the proposal to use agriculturally designated land for waste disposal.

A. CONCERNS

1. LANDFILL

OMAF: Approval of the FGD EA will provide Ontario Hydro the opportunity to propose a "project" which uses landfill disposal as the only alternative waste disposal option and there will be no chance for OMAF or others to challenge it. This is analagous to the situation where OMAF helps a municipality develop an Official Plan with specific land use designations. Once the Plan is approved, OMAF no longer has the opportunity to influence decisions made in accordance with the approved Plan. Also, the EA document provides no incentive for Ontario Hydro to promote waste reuse (ie., gypsum production). Perhaps a ranked list of selection criteria could be developed for determining appropriate waste management options at the project implementation stage and when a "project" is recommended justification for not using the top-ranked criteria (ie., reusing waste) would have to be provided. OMAF suggested that this type of criteria hierarchy would look at waste use options first, followed by various waste disposal options.

OH: Ontario Hydro prefers not to create and manage large landfill sites if it can be avoided in some manner. Landfill is considered to be a worst case waste management alternative but must be available when FGD comes on-line because of the uncertainty of implementing other waste management options. This is the only way Hydro can ensure reliable operation of these systems over the long-term. The analysis carried out in the EA reflects this worst case situation. Even with commercial gypsum production, there may be some sub-standard or excess gypsum which requires landfill disposal.

location of meeting	location	date time
prepared by	name	tel. local

The EA provides Ontario Hydro with the option to use scrubbers in its acid gas control program. This option may not be selected for implementation. In addition to the high cost of scrubbers, there is a cost penalty associated with a re-usable waste process. Ontario Hydro is conducting extensive site-specific studies to determine the cost associated with production of wallboard quality gypsum and identify the premium which the corporation is prepared to pay.

Reg. 281/87 does not prescribe a method for meeting the emission limits (ie., does not specify using a certain FGD process). This could change if MOE pursues its present moves toward BACTEA, as outlined in the Reg. 308 revision. If this occurs, the installation of a useable product FGD process may become mandatory. The gypsum market in Ontario is limited, and may be exceeded by FGD gypsum.

Recognizing government and public concerns regarding landfill, Ontario Hydro will make a provision for gypsum production in the reference design for its proposed FGD systems. This will ensure that the systems specified will be capable of producing a wallboard-quality gypsum product. Actual use of this product will require negotiations with, and commitment by the gypsum industry.

Per commitments made in the FGD EA (Section 3.2.3.3), Ontario Hydro will be looking for ways to use or market FGD waste. Discussions have been undertaken with various groups proposing to make use of the FGD waste, however, it is too early to expect firm commitments. Several gypsum manufacturers have now expressed interest in looking at use of FGD gypsum. Also, the planning staff of the Regional Municipality of Haldimand Norfolk has expressed interest in using FGD waste to backfill a gypsum mine near Caledonia.

Ontario Hydro also is considering co-funding, with EPRI, a gypsum study at the High Sulphur Test Centre (HSTC) at NYSEG's Somerset station.

2. USE OF AGRICULTURALLY DESIGNATED LAND

OMAF: OMAF requests confirmation that the zoning related to agricultural lands quoted in the EA is correct; particularly at Lambton. They also want some reassurance that redevelopment of a landfill area is feasible after rehabilitation, and an estimate of the percentage of land "lost" as a result of landfilling (due to side slopes, buffer, etc.). Use of agricultural or industrial land for landfill is acceptable, provided that it can be returned to constructive use through waste site rehabilitation. OMAF might consider use of agricultural lands (at Nanticoke and Lambton) for waste disposal more favourably if Ontario Hydro agrees to develop the agriculturally designated areas last (ie., use Texaco owned lands at Nanticoke, before 40 ha of agricultural land that is part of Site A--see Figure 4-17 in the EA), if needed at all.

OH: At Nanticoke, approximately 40 ha (east of the existing generating station) of land designated (Haldimand Norfolk Official Plan) for agriculture is proposed for waste disposal. This property is currently a part of an exemption order under the EA Act (OH-24) which gives Ontario Hydro the right to buy the land, on a willing seller basis, as a buffer to its existing operations. The land is not being actively used for agricultural purposes. The current owner is attempting to sell the land and is negotiating with both Ontario Hydro and Texaco.

It is probably possible to develop the proposed waste sites at Nanticoke to utilize this agricultural land last. This may also have some benefits in providing a buffer to future waste site development activities.

At Lambton, approximately 18 ha of land designated (Lambton County Official Plan) for agriculture is included in the area proposed for FGD waste disposal. Much of this area is currently woodlot. A development sequence that would leave this agricultural land to the latter phase of waste site development could also be considered at Lambton.

Details of waste site development sequencing are probably better dealt with at the project implementation phase. OMAF will be invited to participate in these studies.

3. WASTE SITE SELECTION PROCESS CRITERIA

OMAF: The criteria for selecting candidate waste disposal sites at Nanticoke did not include high capability agricultural land as an exclusion criterion.

OH: Agriculture is included under the site evaluation criteria [page 3-28, (d) Land Use, in the EA]. Land with a high capability for agriculture (clay soils) also has good technical properties (ie., low permeability) for waste disposal. Therefore it is felt that exclusion of high capability agricultural areas was not viable. Present agricultural use was also considered in evaluating the candidate sites selected. Given its proximity to major industrial activities and the current negotiations being carried out by the owner to sell the property Ontario Hydro feels selection of the site adjacent to the existing Nanticoke site has the least potential impact on agricultural activities.

B. SUMMARY--RECOMMENDED ACTIONS

In order to resolve OMAF's concerns regarding the FGD EA, Ontario Hydro should consider the following actions:

1) Changes to the project implementation process to include a process by which Ontario Hydro can justify selection of its waste management options for each project implemented. For example, include a ranking hierarchy of reuse/disposal alternatives and reasons for not using re-use options.

2) Confirm that rehabilitated FGD waste sites will support alternate uses and estimate what portion of the site will be developable.

3) Attempt to exclude high capability agricultural land from consideration as proposed waste disposal sites, or alternatively commit to developing these agricultural areas last in the sequence of disposal site development plans.

NOTE: These minutes were reviewed by Tonu Tosine, and OMAF approval of the contents given during a July 14, 1988 telephone conversation.

700 University Avenue, Toronto, Ontario M5G 1X6

August 16, 1988

962-FGD-00540.T3

Mr. Robert Montgomery
Director, Heritage Branch
Architecture and Heritage Planning
Ministry of Culture and Communications
77 Bloor Street West
Toronto, Ontario M7A 2R9

Dear Mr. Montgomery:

Ontario Hydro appreciates the concerns expressed in your June 30, 1988 letter, to Brian Ward, about our proposed Flue Gas Desulphurization Program. We have considered heritage resources in the Environmental Assessment document. They will be researched further during the Project Implementation Phase after a site and technology have been selected. At that time, and prior to work being done on an undisturbed site, Ontario Hydro will, if necessary and as determined in consultation with your Ministry, conduct heritage investigations.

During the Project Implementation Phase, Ontario Hydro will conduct presubmission consultation. I look forward to your involvement in this phase.

Please contact me if you have any further concerns.

Sincerely,

W. M. Paterson
FGD EA Coordinator
Environmental Planning & Assessments
Environmental Studies & Assessments Department
H10 G03

cc W. Green - MOE

700 University Avenue, Toronto, Ontario M5G 1X6

August 16, 1988

962-FGD-00540.T3

Mr. Steven Mitchell
Architect
Ontario Ministry of Education
21st floor, Mowat Block
Queen's Park
Toronto, Ontario M7Z 1L2

Dear Mr. Mitchell:

Thank you for taking the time to review Ontario Hydro's Flue Gas Desulphurization Environmental Assessment. Ontario Hydro appreciates that there may be some schools located near the stations at which we propose to install FGD Technology and that there may be concerns about effects on these schools.

During the Project Implementation Phase (when a site and technology are committed), Ontario Hydro will continue its public involvement program by providing information, holding meetings, and discussing comments. The school boards, whose addresses you have provided, will be notified of all activities pertaining to this project so that they will have the opportunity to participate.

I hope this will be adequate to alleviate any concerns you may have. You will continue to receive all information, including a copy of material sent to the school boards.

Sincerely,

W. M. Paterson
FGD EA Coordinator
Environmental Planning & Assessments
Environmental Studies & Assessments Department
H10 G03

cc W. Green - MOE

700 University Avenue, Toronto, Ontario M5G 1X6

962-FGD-00540-T3
August 18, 1988

Mr. Laurence Moore
Co-ordinator, Electricity Planning Policy
Ontario Ministry of Energy
Queen's Park
Toronto, Ontario M7A 2B7

Dear Mr. Moore:

Ontario Hydro has received a copy of your comments on the Flue Gas Desulphurization Environmental Assessment. I appreciate that you may have some interest in other alternatives to carrying out the program of reducing acid gas emissions. Alternatives, such as demand management and developing new nuclear or hydroelectric resources, are considered in the Environmental Assessment, and will be used to the extent possible, but given present planning assumptions will not likely eliminate the need for future controls such as FGD.

As you know, Ontario Hydro provides a detailed discussion of its options for meeting the electricity requirements of the province in its Supply/Demand Option Study which is now being examined by your Ministry, a panel of five experts and the Select Committee on Energy. These reviews and the resulting demand/supply strategy will have a significant impact of determining our future need for scrubbers, and will be duly considered in developing our future acid gas control strategy. This control strategy will be detailed in a "Ways and Means" Report which Ontario Hydro must submit by January, 1989. Subsequent to the adoption of this control strategy, the need for scrubbers will be reviewed annually as a part of our established process for resource planning for future demand/supply initiatives.

I am confident that the review mechanisms now in place will ensure a thorough review of alternatives before flue gas desulphurization is implemented. Your ministry will be invited to participate in the Project Implementation Process leading to installation of FGD at each of the candidate generating stations.

Sincerely,

W.M. Paterson
FGD EA Co-ordinator
Environmental Planning & Assessments
Environmental Studies & Assessments Department

cc W. Green MOE

ontario hydro

700 University Avenue, Toronto, Ontario M5G 1X6

W. Green

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Included with
OH July 24/88 Letter

July 20, 1988

962-FGD-00540 T3

Mr. J. Toth
Manager,
Consulting & Value Engineering
Services Section,
Ministry of the Environment,
135 St. Clair Avenue West,
Toronto, Ontario
M4V 1P5

Dear John:

Ontario Hydro's FGD EA - Supplemental Information

In response to MOE's comments on Hydro's FGD EA as discussed at our May 25, 1988 meeting (and further clarified at our June 29, 1988 follow-up meeting), I offer the following supplemental information. I have grouped this information into the major areas of concern identified by MOE.

POLICY CONCERNS

1. Evaluation of Alternative FGD Processes

Attached for your information (attachment #1) is a table summarizing Hydro's comparison of Utility Commercial FGD processes (per Figure 3-2 in the FGD EA). A number of these processes are eliminated quickly since they have limited application for scrubbing high sulphur coal. Others are limited by reagent requirements/availability. The Wellman-Lord (W-L) process is currently limited by cost. Studies are now underway to take a closer look at W-L. Initial discussions with sulphur product users have been initiated. Results of this study will be available before the first FGD units are committed. Comments on our comparison table are welcome.

Sorbent furnace injection (LIF) is being retained as an option to provide additional flexibility to our program. LIF is particularly well suited to possible needs at Lakeview - an aging plant where it may be hard to justify the high cost of installing more expensive high efficiency FGD technology. Ontario Hydro is also actively involved in the development of this process. In addition, we are looking at other variations of sorbent injection (eg. Tampella).

.../2

It is important to note that Hydro is not seeking to eliminate any FGD processes from consideration. The candidate processes initially selected and discussed in the EA are those that Hydro feels are commercially developed and/or suit our needs at this point in time. Flexibility to utilize other processes in the future does exist via the Amendment process outlined in the FGD EA.

2. By-Product Utilization

As part of its process selection studies, Ontario Hydro is currently conducting a detailed study of the potential for producing commercial grade synthetic gypsum at Lambton and/or Nanticoke. These studies will be looking at economics as well as the environmental implications of minimizing landfill disposal, and will be completed before any commitment of FGD systems at the candidate generating station sites. The EA looked at the worst case scenario for waste management (ie., landfilling of lifetime wastes). While it is Hydro's intention to pursue all available practical by-product utilization opportunities, we feel that, for system reliability reasons, it is unlikely that gypsum can be produced without some landfill backup capabilities.

In developing its technical specification for the first limestone slurry FGD units, Hydro is currently planning to tender processes that are capable of producing commercial grade gypsum. Commitment to produce a commercial grade product will be contingent on the results of our studies and successful negotiations with a potential user.

3. Conservation

Ontario Hydro has recently submitted a plan for "Electricity Conservation and Efficiency Measures" to the Minister of Energy (June, 1988) which outlines its commitment to and targets for demand management (attachment #2). The report notes that "Ontario Hydro is strongly committed to aggressively implementing economic demand management programs." The plan sets "a target to reduce the need for Ontario Hydro to supply 5500 MW of electrical peak demand by the year 2000 through electrical efficiency improvements, load shifting and parallel generation." About 1840 MW of this reduction will be in-place by 1993, at an estimated cost of $1.2 billion.

This represents an increase in estimates for demand management as presented in the FGD EA and indicates the dynamic nature of Hydro's efforts in this area. Our current forecasts do take into account these increased levels of demand management. Even with these increased levels of demand management initiatives, we will still have to install two scrubbers at one of our coal-fired stations by 1994. The success of the demand management efforts will affect future requirements for scrubbers and will be reviewed annually as part of supply-demand planning.

.../3

Hydro's demand management plan will be reviewed in detail as part of the upcoming Select Committee review of Hydro's Demand-Supply Options Strategy. The FGD EA is not the place to debate this issue.

4. Future Regulations - Clean Air Program (CAP)

Ontario Hydro has provided detailed comments to the Minister of the Environment on the impacts of CAP on the FGD Program (see attachment #3).

We have done some preliminary analysis of emissions from our candidate generating stations using the proposed Regulation 308 models for cases with and without FGD. We first used MOE's Worst Case Model (WCM) - the screening step - to look at implications at all three stations. We are also in the process of using MOE's Gas Model (GM) to do some detailed calculations for Lambton GS - the only one on the three candidate sites that presently has the data base needed to use the GM. Hydro's Research Division will be summarizing the results of these model runs in a report, which we can forward to you when completed.

The WCM results derived thusfar indicated that with:

1. Wet FGD on all units - SO*2 limits are met but NOx limits are exceeded;

2. Partial wet FGD (eg. on 2 units @ Lambton) - SO*2 limits are exceeded and NOx limits are met, and

3. No FGD - SO*2 limits are exceeded but NOx limits are met.

For case 1, even significant reheating of the flue gas (up to 100 degrees F) does not guarantee that NOx limits are met.

In summary then, for the WCM (which uses severe and infrequent meteorological conditions) there appears to be a conflict in meeting the SO*2 and NOx regulatory limits, with or without FGD. To meet SO*2 limits, all units at a given station will have to be scrubbed. However, if this is done, there will be residual NOx problem. Further runs of the GM will be required to confirm the magnitude of this problem. From the WCM results, it appears that it would be prudent to initiate discussions between MOE and Hydro to develop an acceptable approach to dealing with potential NOx problems. We see these types of discussions as being an integral part of the Project Implementation Phase of FGD as well as the current review of proposed Regulation 308 revisions.

It is Hydro's intention to design and operate any FGD systems to meet the "law of the land" in-place throughout the life of scrubber operation.

LAND USE (NOTE: Original copy of information supplied directly to D. Neufeld)

Per a meeting with D. Neufeld of your Land Use Planning Unit on June 15, 1988, the following information is provided.

.../4

1. Sensitive Land Uses

We have reviewed the existing and proposed land uses for a 500 metre radius around the proposed waste disposal sites at Lambton and Nanticoke (see attachments #4).

Lambton

There are only a few structures within close proximity to the proposed FGD waste disposal sites at Lambton GS. A barn, an autowrecker yard and one residence are located south and east of the existing site. The autowreckers will likely be purchased as part of the waste site development, (this is strongly supported by Moore Twp.). A number of residences are located within the 500 metre radius along the river north and south of the existing station site. Our modelling results (Wong, 1988) indicate that it is unlikely that dust from the expanded waste disposal site will have an adverse effect on adjacent properties. Noise levels should also not be a problem. Much of the surrounding land is designated Industrial in the Official Plan and is compatible with waste site use. Re-zoning os a small area (18 ha) of Agricultural designated land at the northeast corner of the proposed disposal sites (see Figure 5-2 in FGD EA) will be required.

Nanticoke

There are 3 permanent residences, a few farm buildings and a number of seasonal dwellings with 500 metres of the proposed FGD waste disposal sites at Nanticoke. One residence (Dennis property) would be displaced by the proposed sites. Purchase of this residence and adjoining property (about 40 ha) is already covered by an existing Exemption Order (OH-24/2) under the EA Act and negotiations are currently being conducted with the land owner. Purchase of all seasonal dwellings along the lakefront and a farm west of Hickory Creek are also covered by OH-24/2. Most of the cottages have already been purchased by Ontario Hydro. Only 4 remain privately owned. Purchase of properties is on a willing seller basis and is to provide a buffer from existing site operations at Nanticoke. A seasonal cottage camp east of Hickory Creek and two residences at Lamb's Corners are also within the 500 metre radius, however, our modelling of off-site dustfall suggests that dust levels at these distances would routinely be well within regulatory limits (see Wong, 1988 supplied to J. Toth on June 9, 1988).

Further residential development in the area adjacent to these proposed waste sites is unlikely given the existence of the Nanticoke Industrial Influence Area that recommends restricting such development for a three kilometre radius around the Nanticoke Industrial Complex (see Figure 5-11 in FGD EA). Most of the land proposed for the waste site is zoned Industrial. A portion of Site A (40 ha - the Dennis farm) is zoned Agricultural.

.../5

2. Waste Site Rehabilitation

Further to MOE Land Use Planning Unit's comments on waste site rehabilitation, I would refer to Hydro Report #87173 (Meek, 1987) for detailed information on site rehabilitation options (that was submitted to J. Toth on June 9, 1988).

All options listed in Section 6.1.3. are technically possible, however, the viability or acceptability of pursuing any of the alternatives will be contingent on discussions with the local municipality.

WASTE DISPOSAL

1. Lambton Waste Disposal Sites

We have checked with Moore Twp. regarding any residual concerns regarding the proposed waste disposal sites at Lambton. Attached is a letter received from Moore Twp. supporting our proposed locations subject to approved zoning amendments (attachment #5).

AIR EMISSIONS

1. Ontario Hydro References

All Ontario Hydro authored reports used in the FGD EA were supplied to MOE on June 9, 1988.

2. Fogging

In response to your note of clarification on the May 25, 1988 minutes, it should be noted that our estimate of wet plume induced ground fog was made on an "all time" (ie., hourly) basis. While it is true that this basis may not be directly comparable to natural fogging, it gives some indication of the magnitude of the issue. Fogging incidence given by Gullett of Environment Canada (via personal communication) was based on daily occurrence.

We will revise the typographical error on natural fogging on pages 5-7, 5-19, and 5-23 to read "11%". This is consistent with the figure given on page 6-11.

3. By-Pass

As noted at the May 25, 1988 meeting it is Hydro's intention to utilize by-pass only for start-up and during emergency situations - estimated to be about 5% of time. By-pass will not be utilized on a routine basis as part of operating procedures.

As requested, we have examined certain by-pass conditions by using the current Regulation 308 model (see attachment #3). The modelling results (table 1) confirm that with up to 75% by-pass, the point of impingement regulations for current SO*2 and NOx can be met.

TABLE 1
Wet Scrubbing By-Pass Analysis
Per Current Regulation 308

Pollutant	By-Pass Unit %	Point of Impingement (ug/m^3) 0.5	1	2	3	Regulatory Limit
		12.5	25	50	75	
SO_2		383	373	305	489	830
NO_2		186	174	63	104	500

Under conditions specified by the revised Regulation 308, by-pass would be unacceptable.

The promised Ministry position regarding by-pass would be helpful to us in developing our operating philosophy and requirements.

PROJECT IMPLEMENTATION PROCESS (PIP)

MOE and other government agencies (as well as the public) will be involved in pre-submission consultation (PSC) for each Project Implementation Report (PIR). The preparation of the PIR for the first units will be initiated when a "project" is announced in October, 1988; with earliest PIR filing not until September, 1989 (following approval of the EA). Filing must be made before any on-site work can be initiated - on-site construction for the first units must start by the spring of 1990 to meet a 1994 in-service date. The six month lead time requested by MOE is achievable.

The PIP is an integral and mandatory part of the approval being requested by Ontario Hydro in the FGD EA.

.../7

I trust this information responds to concerns expressed by MOE technical reviewers. Please contact me if you require any additional information or clarification.

Yours truly,

W.M. Paterson
FGD EA Coordinator
Environmental Studies & Assessments Department

cc: W. Green, MOE

Attachment

ATTACHMENT TO
JUNE 20/88 LETTER
CH → J Tor

List of Attachments

Attachment #	Description
1	FGD Process Comparison Table
2	Report on Electricity Conservation and Efficiency Measures
3	Ontario Hydro Comments on CAP (letter Franklin to Bradley, April 29, 1988)
4	Land Use Maps for Lambton and Nanticoke waste sites and vicinity
5	Letter from Moore Township in support of Lambton GS waste site

ATTACHMENT #1

COMPARISON OF UTILITY COMMERCIAL FGD PROCESSES

CRITERIA / TECHNOLOGY	SO2 REMOVAL (%)	RELIABILITY (%)	INSTALLED CAPACITY (Mw)	REAGENT	COAL APPLICATION	STATUS	CAPITAL COST $/kW @ ($1982)	SYSTEM TYPE	SOLID WASTE QUANTITY (kg/pr/560 Mw)	LIQUID EFFLUENT	LAND REQUIREMENT (ha/560 Mw)	WASTE REUSE POTENTIAL	OTHER RESTRICTIONS	CONCLUSIONS
ONTARIO HYDRO SPECIFICATION	>90	>90		LIME/LIMESTONE	BEDDING TO HIGH SULPHUR	COMMERCIAL		WET/DRY	FGD AND ASH			PREFERRED		
WET LIMESTONE SLURRY (BASE CASE)	>90	90	53,000	Limestone	Low to High Sulphur	Commercial	80,000,000	Wet	1.3 x 10 5	Yes**	31 Not Stack	Possible Gypsum Wallboard	Gypsum market economics unpredictable	Viable Option
ALKALINE ASH	Varies >90	Not Available	>1000	Alkaline Ash Lime/Limestone Supplement	Low sulphur	Commercial	10 to 15 % less than Base Case	Wet	Similar to Base Case	Yes	31	No	Plant must produce alkaline ash	Unlikely Ontario Hydro will need to scrub low sulphur coal
BELCO-YORTON	93	Not Available	573	Flyash Lime	Low Sulphur	Commercial	Lower than Base Case	Wet	Similar to Base Case	Yes	31	No	High energy requirement limited to low sulphur coal	Unlikely Ontario Hydro will need to scrub low sulphur coal limited experience
● KELLOGG-HEIL	90	Not Available	3477	Magnesium Hydroxide Lime/Limestone	Low or high sulphur	Commercial	Similar to Base Case	Wet	Similar to Base Case	Yes**	31	Possible Wallboard gypsum	Retrofit requires larger space because of horizontal absorber	Vendor variation of wet limestone slurry--will be considered
● MITSUBISHI	90	Excellent	1000	Lime/Limestone	High Sulphur	Commercial	Similar to Base Case	Wet	Similar to Base Case	Yes**	31	Possible Gypsum Wallboard	Susceptible to scaling Best experience on oil-fired boilers Market economics unpredictable	Vendor variation of wet limestone slurry--will be considered
SODIUM CARBONATE	High	Not Available	3155	Sodium Carbonate	Low sulphur	Commercial	Lower than Base Case	Wet	Greater than Base Case	Yes	>31	Uncertain Possible sale of salt cake	Reagent cost high Salts produced are soluble and pose potential ground water problems Salt cake market unpredictable Operation limited to arid sites Requires evaporative pond	Arid climate needed to limit waste concerns Source of abundant NaCO3 needed Low sulphur coal application
LIMESTONE DUAL ALKALI	>95	90	600 North America 2050 Japan	Soda Ash Limestone	Low to high sulphur	Commercial	Slightly lower than Base Case	Wet	Similar to Base Case	No	26	Possible Wallboard gypsum	High moisture content in waste Fewer plugging and scaling problems Market economics unpredictable	Viable option
MAGNESIA SLURRY	>90	Up to 90	959	Magnesium Oxide	Medium to high sulphur	Commercial	Significantly higher than Base case	Wet	Significantly lower than Base Case	No	Minimal	Yes Sulphur or sulphuric acid	Possible materials handling problems High energy costs Market economics unpredictable	High cost Limited experience
WELLMAN-LORD	>90	Not Available	2895	Sodium Hydroxide or Sodium Carbonate	Low to High Sulphur	Commercial	Significantly higher than base case	Wet	Significantly lower than Base Case	No	Minimal	Yes Elemental sulphur or sulphuric acid	Disposal of sodium sulphate Waste is water soluble Process is complex and energy requirement is high Market economics unpredictable	High cost Under study by Ontario Hydro
LIME SPRAY DRYER	>50	80	4150	Lime	Low Sulphur High sulphur experimental	Commercial	Similar to Base Case	Dry	Similar to Base Case	No	28	Unlikely	Produces ash and waste combined by-product Restricts ash sales	Technically viable option Ontario Hydro co-funding TVA work high sulphur coal

NOTES: ● Vendor variation of wet limestone slurry process
** Closed loop operation or equivalent possible

SOURCES: EPRI CS-3333, The Evaluation and Status of Flue Gas Desulphurization Systems January, 1984
Ontario Hydro, Flue Gas Desulphurization Program -Environmental Assessment, February, 1980

+ S.E.M.P
+ Market Sector Plans
+ List of Publications. } → Wong

ATTACHMENT #2

Ontario Hydro's Plan for **Electricity Conservation & Efficiency Measures**

Response to the Honourable Robert Wong Minister of Energy

ENERGY MANAGEMENT BRANCH
June 1988

EXECUTIVE SUMMARY

ONTARIO HYDRO IS COMMITTED TO AN ENERGY EFFICIENT ONTARIO

Electricity is essential to the economic well being of Ontario and to the lifestyles of the people in the province. Demand management initiatives to reduce growth in the demand for electricity will make a critical contribution to meeting customer needs for reliable supply, reasonable prices and control of energy costs in the 1990's. **Ontario Hydro is strongly committed to aggressively implementing economic demand management programs.**

This ambitious demand management effort is consistent with Government policy for a more energy efficient Ontario and is responsive to public preferences.

Ontario Hydro's demand management initiatives include:

- increasing conservation and electrical efficiency improvements by providing information, services and in many cases, incentives
- shifting electricity use from periods of peak demand to valley periods
- increasing energy and/or process efficiency by providing information and services on the use of electricity in applications where customers benefit.

In addition, Ontario Hydro is encouraging more parallel generation.

We have set a target to reduce the need for Ontario Hydro to supply 5,500 megawatts (MW) of electrical peak demand by the year 2000 through electrical efficiency improvements, load shifting and parallel generation. This is equal to about 25% of the current peak electricity demand.

By 1993, we plan to have achieved about 1,840 MW of this reduction. The program is expected to cost about $1.2 Billion over the next six years.

Achieving these results will be a challenge. Ontario Hydro cannot do it alone. By providing leadership in concert with the Government and continuing to work with the Municipal electric Utilities and the others in the electrical industry, we can move toward a significantly more energy efficient Ontario in the 1990's.

This report concentrates on the demand management initiatives of **electrical efficiency improvements and load shifting.**

TABLE OF CONTENTS

1.0 Introduction

1.1 ONTARIO HYDRO IS COMMITTED TO AN ENERGY EFFICIENT ONTARIO

Ontario Hydro provides a product that is essential to the economic well being of Ontario and to the lifestyles of the people of the province. Demand management initiatives to reduce growth in the demand for electricity will make a critical contribution to meeting customer needs for reliable supply, reasonable prices and control of energy costs in the 1990's. Ontario Hydro is strongly committed to aggressively implementing economic demand management programs.

An ambitious demand management effort is consistent with Government policy for a more energy efficient Ontario and is responsive to public preferences.

Helping customers use their energy resources more efficiently will contribute to customer satisfaction and to provincial conservation and energy efficiency goals by:

- encouraging efficient energy use in all sectors
- improving industrial productivity and competitiveness through the use of electrotechnologies
- contributing to system efficiency through load shifting
- contributing to electricity reliability in the late 1990's by reducing electricity demand.

In summary, we see demand management as an economic way of helping to meet the forecast growing need for electricity.

1.2 DEMAND/SUPPLY GUIDING PRINCIPLES PROVIDE STRATEGIC DIRECTION

Ontario Hydro's draft "Demand/Supply Planning Strategy" provides a context and set of objectives for long range planning of demand and supply resources which will meet customer needs for electric service and give the highest value in terms of social and environmental acceptability and cost. Demand management initiatives are a priority as the strategy indicates:

- demand reducing options will be pursued to the full extent they are economic compared to the available supply options

- planning and implementation of demand management options will be undertaken in close cooperation with the Municipal Utilities

- technical research and market development will be given a high priority

- education, information, audits and advertising will be pursued to make customers aware of the opportunities for efficient and effective electrical use

- financial incentives should be high enough to encourage customers to increase efficiency

- customers who participate in demand management programs and thus receive direct benefit should contribute to the cost.

1.3 THE ENERGY MANAGEMENT DIRECTION INCLUDES BOTH CUSTOMER SERVICE AND DEMAND MANAGEMENT

Ontario Hydro is committed to customer satisfaction and the creation of long term value through encouraging the efficient use of electricity and the use of electricity where customers benefit. Ontario Hydro positions electricity as a reliable, efficient and valuable energy uniquely suited to meet customer needs in a wide variety of applications.

Demand Management is influencing the amount and/or timing of electricity consumption. It includes the encouragement of:

. improvements in the efficiency of electrical use (through information, services and incentives)

. shifting electrical use from periods of peak demand (rate-driven and direct control)

. increasing energy and/or process efficiency by providing information on the use of electricity in applications where customers benefit

In addition, Ontario Hydro is actively seeking non-utility or "parallel" generation.

Demand management programs will enhance the package of customer services we already provide our customers. They will be able to select the program that best meets their particular needs. As such, demand management will improve customer service.

1.4 THE NEED FOR DEMAND MANAGEMENT HAS INCREASED

In the last year, expectations for demand management initiatives have increased significantly. Higher than anticipated provincial load growth has raised concerns that new generation capacity may be required sooner than expected to meet customer needs. A majority of our customers continue to favour the use of demand management options to help reduce the need for new generation. The Provincial Government and the Municipal Electric Association both strongly support demand management options as part of Ontario Hydro's planning for future electricity needs.

This has resulted in an acceleration of our demand management effort to deliver greater results while maintaining a high level of customer satisfaction.

1.5 TARGETS HAVE BEEN SET

Ontario Hydro projects that the demand for electricity would grow from approximately 21,500 megawatts (MW) in 1987 to approximately 31,800 MW by the year 2000 if the efficiency of electricity use were frozen at the 1985 level. Our target is to reduce the need for Ontario Hydro to supply 5,500 MW of electrical peak demand by the year 2000 through an array of demand management initiatives and parallel generation.

The demand management initiatives fall into the categories of **electrical efficiency improvements** and **load shifting**.

The drive to promote higher **electrical efficiency** is expected to reduce demand by 3,500 MW.

- Some of this (1,500 MW) will come about naturally as our customers replace old equipment, improve the insulation in their homes, upgrade their offices and factories, etc. The information and services we provide to our customers to alert them to their opportunities to make more efficient use of electricity and save money will contribute to gaining the natural conservation. Our programs to encourage natural conservation are referred to as "information-driven" electrical efficiency improvements in this report.

- The balance of the target (2,000 MW) will result from Ontario Hydro programs that provide incentives to stimulate improvements in electrical efficiency that would not otherwise occur. This target is based on estimates of the total amount of incentive-driven efficiency improvement that could be theoretically obtained at costs less than or comparable to Hydro's major supply options.

The target for **load shifting** is 1,000 MW. Ontario Hydro will be working to get customers to reschedule some of their electricity use from the high demand hours of the day to the off-peak hours.

- It is expected that much of this will result from customers responding to the Time-Of-Use rates that Hydro has proposed to the Ontario Energy Board for implementation in 1989. We believe that these rates, which more accurately reflect electricity costs, will permit our customers to save money and reduce the peak demand on Hydro's power system.

- The balance of the target for load shifting will be met through agreements with customers to permit utility control of the hours when selected electrical equipment will operate.

The target for **parallel generation** is 1,000 MW. This will be achieved through the encouragement of private development of all types of small generation and cogeneration by means of power purchase agreements.

Shortly a bidding process will be introduced to encourage the widest possible participation by the private sector.

This report focuses on Ontario Hydro's plan for **electrical efficiency improvements and load shifting**.

FIGURE 2.1

SOME PROGRESS HIGHLIGHTS

- The "Energy Tips" program to heighten public awareness of energy efficiency and encourage them to send in energy saving ideas resulted in 10,000 suggestions.

- MBM Ceramics in Toronto improved their process efficiency, plant productivity and product quality through the installation of microwave drying equipment developed by Ontario Hydro research staff. Drying time was reduced from 24 hours to 6 minutes.

- Janet Lee Public School in Stoney Creek was the first in the province to install a ground source heat pump. Energy savings are estimated at over $7000 a year with a payback period of less than 5 years. It is now one of the most energy efficient schools in Ontario - encouraging other school boards to study its operation for possible applications.

- JDS Investments Ltd. installed a water loop heat pump system in their Markville Shopping Centre in Markham. Low energy costs and high tenant satisfaction with individual store controls have resulted in JDS incorporating similar systems in two of their other shopping mall projects.

- The Toronto Harbour Castle Westin saved over 33% on their total electricity bill by retrofitting energy efficient lighting in the hallways and parking garage and making changes to their hot water heaters and chillers. Payback period was less than 3 months.

- Canadian Automotive Manufacturing Incorporated (CAMI) - a joint venture between General Motors and Suzuki - was influenced to purchase Ontario-made high efficiency motors rather than U.S.-made standard efficiency motors for their new car plant in Ingersoll.

- Fifteen companies are participating in energy monitoring demonstration projects being done jointly with the Ministry of Energy. These will identify ways customers can use energy more efficiently. Average annual savings could be 16-20% with a 16 month payback period.

- Customers' and other internal and external stakeholders' knowledge of energy application and product development information has been enhanced by advertising, energy management publications, energy manuals, product knowledge sheets, building data sheets, reference and design guides, demonstrations, trade shows and research projects.

- Support programs have been developed to encourage customer participation. These include the EnerMark Loan Plan, Business Finance Plan, Feasibility Study Assistance Plan, and energy advisory services.

2.0 Situation Assessment

2.1 PROGRESS HAS BEEN MADE ON ENERGY MANAGEMENT

Encouraging the efficient use of energy while meeting the special service needs of different customers has been a cornerstone of Ontario Hydro's energy management strategy. Over the last few years, significant progress has been made towards developing a knowledge of customer needs and market opportunities, encouraging Municipal Utility and ally support and initiating concept testing and demand management research. Figure 2.1 highlights some examples of these accomplishments.

Ontario Hydro is now changing gears as we move from Phase I of our energy management strategy into Phase II (Figure 2.2). Higher targets for electrical efficiency improvements have been set to reflect the more urgent need for results. Research, development and program implementation work are being accelerated. Implementation of incentive-driven programs has begun along with the introduction of other components of the strategy such as time-of-use rates.

FIGURE 2.2
STRATEGIC DIRECTION FOR ENERGY MANAGEMENT

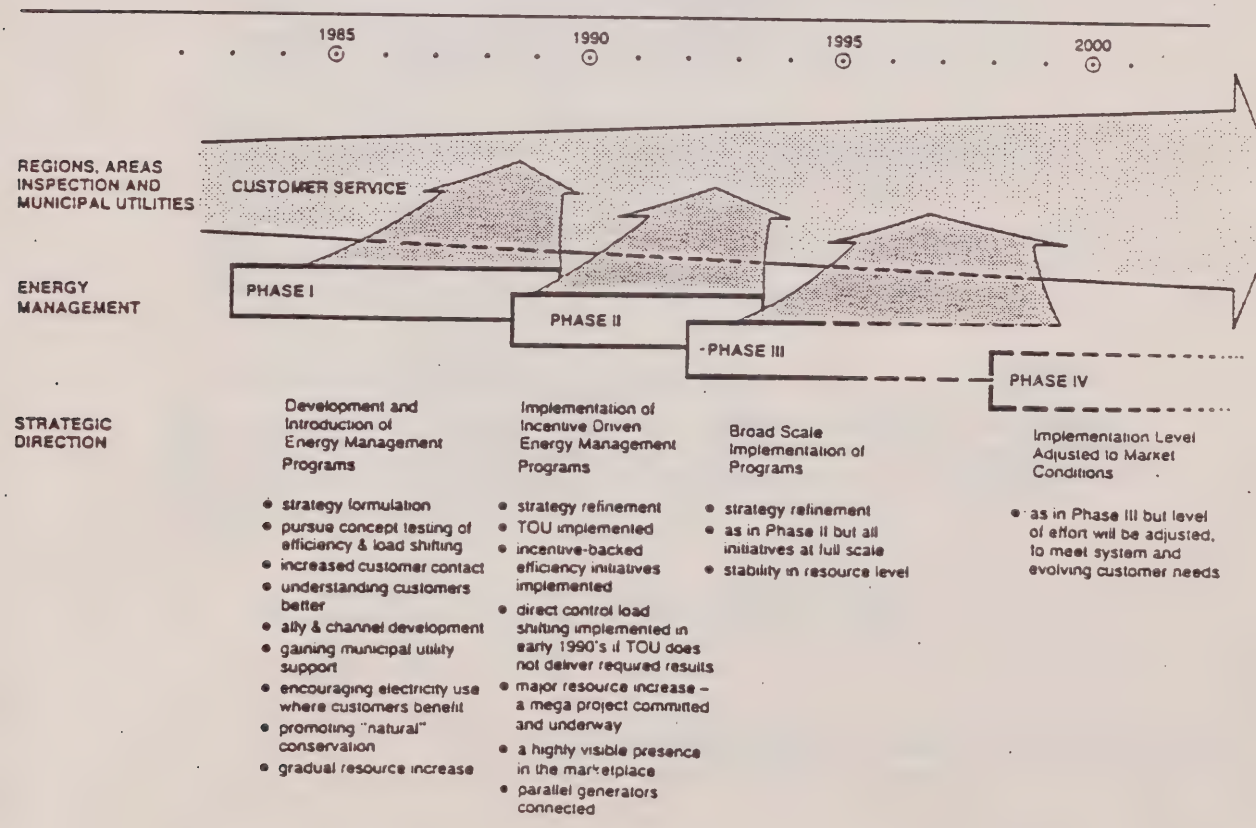
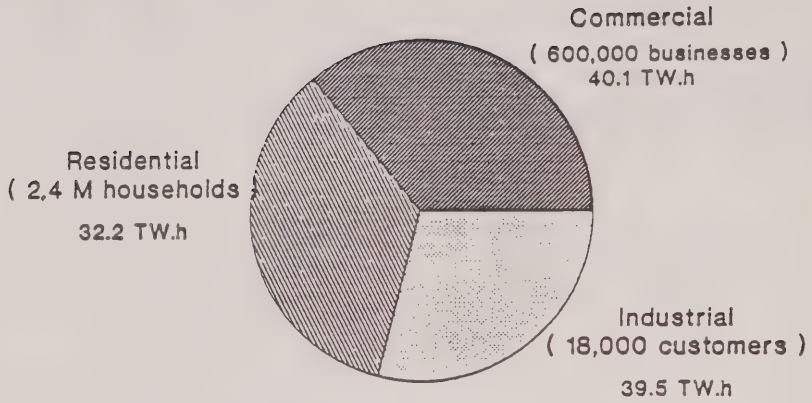


FIGURE 2.3
ELECTRICITY USE
BY CUSTOMER SECTORS



Total electricity used = 111.8 TW.h

Residential	
Space/Water Heating	51%
Appliances	46%
Air cooling	3%

Commercial	
Motors and Equipment	40%
Lights	40%
Space/Water Heating	10%
Air Cooling	10%

Industrial

Motors and Equipment	75%
Process Heating	14%
Lights	11%

Source: Market Planning Department April 1988
(Based on 1986 End-Use information)

2.2 ACHIEVING SIGNIFICANT RESULTS WILL BE A CHALLENGE

Significant opportunities exist for reducing or changing electricity use by electrical efficiency measures and load shifting. However, delivering results will be a challenge that will require leadership from Ontario Hydro in understanding customer needs and market forces.

Programs must be sensitive to different customer needs:

Ontario Hydro and the Municipal electric Utilities serve approximately 3.6 million households, businesses and industrial customers in three market sectors:

Residential - homes, farms, cottages
Commercial - offices, condominiums, retail establishments, hotels, restaurants, institutions
Industrial - mining, processing, manufacturing

Each sector consumes about one third of the total electricity used in Ontario but electricity is used for significantly different purposes in each (see Figure 2.3). As a result, distinct energy management strategies must be developed for each sector centered on the key benefits customers receive from electricity:

Residential - increased efficiency, comfort and convenience
Commercial - improved energy management and quality owner/tenant environment
Industrial - reduced process cost, increased productivity and competitiveness

Customers increasingly perceive electricity as an energy service and therefore are looking at the total package of products and services on the basis of "value" added to their lifestyle or work place. To be successful at encouraging customers to use electricity more efficiently or change their pattern of electrical use, Ontario Hydro must develop innovative ways to match our products and services to individual customer needs - offering customers a broader menu of programs to choose from.

Program "Take Up" is difficult to predict:

Successful encouragement of electrical efficiency measures will depend on the degree of customer participation in our programs. Encouraging customers to change their pattern of electricity use and perhaps adopt new and unfamiliar technology will not be easy. Customer "take up" can be impeded by a number of influences:

- customer knowledge of the opportunities available for electrical efficiency improvements and load shifting
- customer comfort with existing technology
- cost and performance of new technology

- customer perceived value vs. costs. A customer may be unwilling to take a risk with new technology without a relatively short payback period

- inaccurate customer perceptions that conservation measures mean a reduction in "value" of their lifestyle or work place

- evolving customer needs as the energy marketplace changes

As an example, a demonstration project is underway in Guelph to increase customer awareness and test the effectiveness of incentives on the purchase of high efficiency motors. Initial response has been lower than anticipated. Follow up survey work is indicating difficulties in:

- targeting awareness programs to those specific businesses or industries where the product is most beneficial

- reaching the key decision makers

- assessing the effectiveness of delivery channels in ensuring energy information reaches the customer

- tracking the effect of awareness programs on customer decisions to purchase high efficiency equipment

- setting the appropriate incentive level

- ensuring product availability to meet customer response

2.3 MUNICIPAL UTILITY AND ALLY SUPPORT IS ESSENTIAL

Ontario's 316 Municipal Utilities serve 75 percent of the province's electrical customers. To succeed, energy management initiatives will need to involve many customers who are not Ontario Hydro customers directly. The commitment, support and capability of the utilities will be vital in ensuring customer satisfaction in the successful delivery of energy management programs.

While Ontario Hydro works closely with our customers through our regions, areas, inspection offices, and Major Accounts Department, we will also need to build on the market knowledge and close customer relationships that the Municipal Utility network provides. This may include funding for utility efforts on demand management where there is a province-wide benefit. For example, Ontario Hydro may fund the cost of hiring and training utility staff to deliver demand management programs. A menu of efficiency programs will enable the utilities to choose programs that best suit their customer needs.

Allies such as architects, consultants, trade associations, and manufacturers are also key channels for program delivery. Ontario Hydro will need to strengthen these contacts to ensure these channels are available.

2.4 INCREASED RESOURCES ARE REQUIRED

By 1993, Ontario Hydro plans to have achieved about 1,840 MW through improved electrical efficiency, load shifting and parallel generation. The cost over the period to 1993 for the Energy Management Branch, the energy management function in the Regions Branch and parallel generation will be about $1.2 Billion.

Of this total, over $500 Million will be spent on electrical efficiency and $100 Million on the load shifting programs outlined in section 3 of this report.

In the demand management initiative, we plan to "use the marketplace" as much as possible. As noted, Municipal Utility and ally support is essential. We will multiply our impact on how electricity is used in Ontario by working with our customers, utilities, contractors, consultants, etc and by providing incentives directly to customers. About $300 Million of the $600 Million noted above will be spent as incentives and to hire consultants.

Costs to encourage the participation of Municipal Utilities could be in addition to these costs.

FIGURE 3.1

MARKET SECTOR BREAKDOWN BY SEGMENT

SECTOR	RESIDENTIAL/ AGRICULTURE	COMMERCIAL	INDUSTRIAL
MAJOR SEGMENTS	New Housing Existing Housing Agriculture	Multi Residential Offices Retail Hospitality Public/Institutions	Auto/Transportation Equipment Chemicals Non Metallic Minerals Food & Beverage Primary Metals/Steel/Secondary Metals Mining Wood & Wood Products General Manufacturing Apparel & Textiles

3.0 Electrical Efficiency and Load Shifting Programs

3.1 PROGRAM STRATEGIES HAVE BEEN DEVELOPED

Energy management program direction has been established for each of the three market sectors - Residential, Commercial and Industrial. Within this context, programs are developed to meet the specific needs of customers in each segment. Figure 3.1 shows the sector breakdown by segment. General program strategies include:

- Focus will be on new construction to minimize lost opportunities for efficient equipment and process design.

- Customized energy audits, and market and demand management research will be used to define efficiency improvement opportunities, market barriers, and determine where incentives are necessary to implement such opportunities.

- A high priority will be placed on increased development and testing of electrically efficient products and energy efficient electric technologies to ensure their availability for use in programs.

- Opportunities for demand management are not equal in all segments and therefore preference will be given to those opportunities that have the highest likelihood of customer acceptance.

- Programs will be flexible to respond to changes in electrical load growth and to changes in the marketplace.

- Implementation of incentive-driven electrical efficiency programs has begun. By the early 1990's a broad portfolio of programs will be available for delivery allowing customers to choose programs that best suit their individual needs.

- These programs will be integrated into the existing package of customer services now offered by Ontario Hydro (billing, rate structure and rate design, energy information, major accounts and customer advice, etc.).

- There will be significant opportunities for the private sector (energy consultants, architects, contractors) to assist Ontario Hydro and the Municipal Utilities in program delivery.

The following sections outline the electrical efficiency and load shifting programs for the three market sectors - and within the current business planning horizon outline the following for each:

- early program initiatives (1988 and 1989)
- programs slated for longer term delivery (1990 to 1993)
- research and development work to be undertaken as program support.

3.2 RESIDENTIAL/AGRICULTURAL SECTOR PROGRAMS

Megawatt Reduction Targets:

Residential	In 1989	By 1990	By 1993
Electrical Efficiency			
Information-Driven	3	6	20 MW
Incentive-Driven	3	8	37 MW
Load Shifting	0	2	18 MW
Totals	**6 MW**	**16 MW**	**75 MW**

Source: 1989-93 Business Plan estimates (1988 megawatt reductions are not included).

3.2.1 Early Program Initiatives - 1988 and 1989:

Information-Driven Electrical Efficiency Improvements

- Energy Information Program focus on ensuring customer is able to get energy questions answered through literature, advertising, bill inserts and in-home energy services.
- Trade shows, exhibits and displays to further inform customers about efficient energy use.
- EnerMark Store operating in Toronto where customers can receive information and have energy questions answered.
- Energy Advisory Service for agricultural customers.
- Assistance to Municipal Utilities and allies to participate in household energy information services (i.e. heating/cooling analyses).
- Targeted advertising inserts to builders, association contacts and customers in the renovation segment.
- Model Homes - co op sponsorship of energy efficient features
- Contribution to the provincial government development of efficiency standards for appliances (ie. EnerGuide testing)

These initiatives are expected to result in about 5 MW of load reduction in 1988 and 1989.

Incentive-Driven Electrical Efficiency Improvements

New Housing:

- Incentives for EE/R2000 upgrades targeted to all electric households
- Incentives for Ground Source/Bivalent Heat Pumps targeted to Non-Gas Areas

Existing Housing:

- Incentives for efficient lighting, window replacements, and thermal envelope upgrades - initially tightly targeted and localized.
- Incentives for Ground Source/Bivalent Heat Pumps in all electric homes
- Base heat pump program for "add-ons" continues

Agriculture:

- Targeted incentives for high efficiency fan motors

Financial Assistance:

- EnerMark Loan Plan

Load Shifting Programs

- Direct control of water heating will be promoted in high electric penetration areas
- Guidelines for optional residential Time-Of-Use rates will be available to municipal utilities starting in 1989.

<u>Program Initiatives - 1990:</u>

Incentive-Driven Electrical Efficiency Improvements

New Housing:

- R2000 Program pickup (from Energy Mines & Resources Canada)

Load Shifting Programs

Water Heating:

- Incentives for dual tank program for Direct Control of water heating

3.2.2 Residential/Agricultural Research & Development Program Support:

Thermal Envelope Upgrades	-	Assess energy effectiveness of various thermal retrofits such as upgraded windows, chimneys, ventilation and furnace sizing in electrically heated homes (1000 energy audits)
	-	Assess customer acceptance through market research
New Housing Thermal Envelope	-	Testing of incentives to builders and/or new home buyers to build R2000 standard
	-	Joint study between Ontario Home Builders Assoc., Ministry of Energy and Energy Mines and Resources to demonstrate efficiency levels of new technologies
Ground Source/Bivalent Heat Pumps	-	Field demonstrations of technologies to verify efficiency and customer acceptance (Northeastern and Northwestern Ontario)
	-	May involve incentive level testing
Energy Management Systems	-	Survey of technologies
"Smart House"	-	Work with the Canadian Standards Association to modify the Canadian Electric Code to accommodate "intelligent" buildings. Work through CABA (Canadian Automated Building Association) to realize specific technology innovations
High Efficiency Lighting	-	Assess efficient lighting technologies
	-	Evaluate energy efficiency and customer acceptance e.g. sentinel lights
Appliances	-	Assess the potential impact of new appliance standards
	-	Encourage use of higher efficiency appliances
Direct Control of Water Heating	-	Assess various load management communication systems
	-	Field demonstrations of equipment
	-	Test marketing of storage water heating
Time-Of-Use Research	-	Assess customer attitudes and likely response to Time-Of-Use rates

3.3 COMMERCIAL SECTOR PROGRAMS

Megawatt Reduction Targets:

Commercial	In 1989	By 1990	By 1993
Electrical Efficiency			
Information-Driven	45	90	225 MW
Incentive-Driven	6	22	76 MW
Load Shifting	10	27	182 MW
Totals	**61 MW**	**139 MW**	**483 MW**

Source: 1989-93 Business Plan estimates (1988 megawatt reductions are not included)

3.3.1 Early Program Initiatives-1988 and 1989:

Information-Driven Electrical Efficiency Improvements

- Promotion of trade/ally understanding of energy management thrust through increased ally contact, workshops, trade shows and increased participation in industry associations
- Literature and other promotional vehicles including business newsletters, energy management brochures and manuals, design guides and co-op promotion will focus on program achievements and demonstration work
- Customer services including billing analysis to identify opportunities for efficiency improvements

These initiatives are expected to result in about 80 MW of load reduction in 1988 and 1989.

Incentive-Driven Electrical Efficiency Improvements

- On-site energy audits to assess energy usage and recommend improvements
- High Efficiency Lighting design
- Streetlighting - joint program with Ministry of Energy
- Room Motion Sensor Setback Controls (Hospitality)
- Individual Metering in New Construction (Multi-Residential)
- Financial Assistance: Business Finance Plan
  Feasibility Study Assistance Plan

Load Shifting Programs

- Thermal Cool Storage (Offices, Public/Institutions)
- Individual Metering/Load Control Water Heaters
- Load control of 60 gallon insuite water heaters and load control equipment (Multi-Residential)
- Cook/Chill Technology (Hospitality, Public/Institutions)
- Time-Of-Use rates for direct commercial customers of Ontario Hydro and large users served by municipal utilities. Guidelines for Time-Of-Use rates for smaller commercial customers will be available to utilities starting in 1989.

Program Initiatives - 1990 to 1993:

Incentive-Driven Electrical Efficiency Improvements

- Ground Source Heat Pumps (Offices, Retail)
- High Efficiency Motors and Controls
- High Efficiency Architectural Designs
- Electronic Submetering in Retrofit (Multi-Residential)
- High Efficiency Lighting Packages
- Energy Management Control Systems in new Construction (Offices, Public/Institutions)
- Thermal Envelope Upgrades
- Heat Pumps in Non-Gas Areas
- High Efficiency Refrigeration (Retail)
- Heat Recovery in Restaurants (Hospitality)

Load Shifting Programs

- Seasonal Energy Storage (Offices, Public/Institutions)

3.3.2 Commercial Research And Development Program Support:

Energy Audits	-	Assess effectiveness of incentives on the implementation of electrical efficiency improvements
In-House Efficiency Program	-	Feasibility study of Ontario Hydro facilities
High Efficiency Lighting	-	Product assessments of various technologies
	-	Demonstrate energy effectiveness of various technologies (Retail, Multi-Residential, Hospitality, Offices)
	-	Market research and assess effectiveness of incentives on technology purchases
Architectural Design and Products	-	Demonstrate energy effectiveness (Offices, Multi-Residential, Retail)
	-	Assess customer acceptance through market research
Ground Source Heat Pumps	-	Demonstrate energy effectiveness in new and retrofit buildings (Offices, Public/Institutions)
Heating, Ventilation and Air Conditioning	-	Research studies and demonstrations of selected technologies
	-	Test effectiveness of incentives on utilization of efficient technologies
Room Motion Sensors	-	Demonstrate energy effectiveness of motion sensitive setback controls (Hospitality, Multi-Residential)
High Efficiency Motors	-	Assessments of new motor designs
	-	Market research and penetration studies to assess effectiveness of incentives on encouraging purchase
Electronic Submetering Systems	-	Undertake market research and evaluate the performance of individual metering in reducing energy use (Multi-Residential)

Thermal Envelope Upgrades	-	Assess energy effectiveness of various thermal retrofits such as upgraded windows and ventilation (Offices, Retail, Multi-Residential)
	-	Assess customer acceptance through market research
Energy Management Control Systems	-	Demonstrate energy effectiveness (Offices, Public/Institutional)
	-	Assess customer acceptance through market research
High Efficiency Refrigeration	-	Market research studies and demonstrations of selected technologies to improve energy efficiency (Retail)
Direct Control	-	Assess various load management communication systems
	-	Field demonstrations of equipment (Multi-Residential)
	-	Assess customer acceptance
Seasonal Energy Storage	-	Assess technical and economic feasibility of various technologies (Offices)
	-	Market research to assess customer acceptance
Time-Of-Use Rates	-	Assess customer attitudes and likely response to Time-Of-Use rates. Pilot studies of some smaller customers.

3.4 INDUSTRIAL SECTOR PROGRAMS

Megawatt Reduction Targets:

Industrial	In 1989	By 1990	By 1993
Electrical Efficiency			
Information-Driven	28	58	148 MW
Incentive-Driven	5	15	70 MW
Load Shifting	70	140	380 MW
Totals	**103 MW**	**213 MW**	**598 MW**

Source: 1989-93 Business Plan estimates (1988 megawatt reductions are not included)

3.4.1 Early Program Initiatives - 1988 and 1989:

Information-Driven Electrical Efficiency Improvements

- Increased customer contact and services through plant energy and lighting audits, plant energy monitoring and billing analysis to identify opportunities for efficiency improvements
- Industry/ally involvement through participation in task forces, industry associations, seminars and trade shows
- Literature on various electrically efficient technologies and programs, case studies, payback periods and technology reference guides
- Wide publicity of the introduction of Time-Of-Use rates

These initiatives are expected to result in about 40 MW of load reduction in 1988 and 1989.

Incentive-Driven Electrical Efficiency Improvements

- Plant Energy Audits
- High Efficiency Motors
- Heat Pumps (Food & Beverage)
- Improvements in Pulp and Paper Process
- Financial Assistance: Business Finance Plan
  Feasibility Study Assistance Plan

Load Shifting Programs

- Time-Of-Use rates implemented in 1989 for Ontario Hydro direct customers and large users of municipal utilities. TOU guidelines for smaller industrial customers will be available starting in 1989.
- Electric Forklift Trucks (off-peak recharging)
  (Auto/Transport)

About 70 MW of load reduction is expected to result in 1988 and 1989 from energy management initiatives in Steel and Metals segments and the introduction of Time-Of-Use rates.

Program Initiatives - 1990 to 1993:

- Incentives for Variable Speed Drives
- High Efficiency Lighting
- Incentives for other electrical process efficiency improvements

3.4.2 Industrial Research and Development Program Support:

High Efficiency Motors	- Assessments of high efficiency motor designs - Market research and penetration studies to assess effectiveness of incentives on encouraging new or replacement purchase
High Efficiency Lighting	- Field marketing survey of current lighting uses to identify opportunities for lighting efficiency improvements - Monitor customer acceptance
Plant Audits	- Co-operative study with the Ministry of Energy to improve estimates of process energy consumption
Electrical Efficiency Potential	- Studies to refine estimates of electrical efficiency potential in a number of segments (Wood, Transportation, Food & Beverage, Other Manufacturing)
Process Efficiency Improvement Studies	- A range of studies to assess the potential of various process technologies in saving overall energy use, improving productivity and product quality (ex. Electrothermal, Electrochemical)
Variable Speed Drives	- Assessments of product technologies and performance - Market research to determine customer acceptance
Time-of-Use Rates	- Market research to determine customer attitudes amd likely response. - Pilot studies of smaller customers to assess impact.

FIGURE 4.1

MEGAWATT* LOAD REDUCTION TARGETS

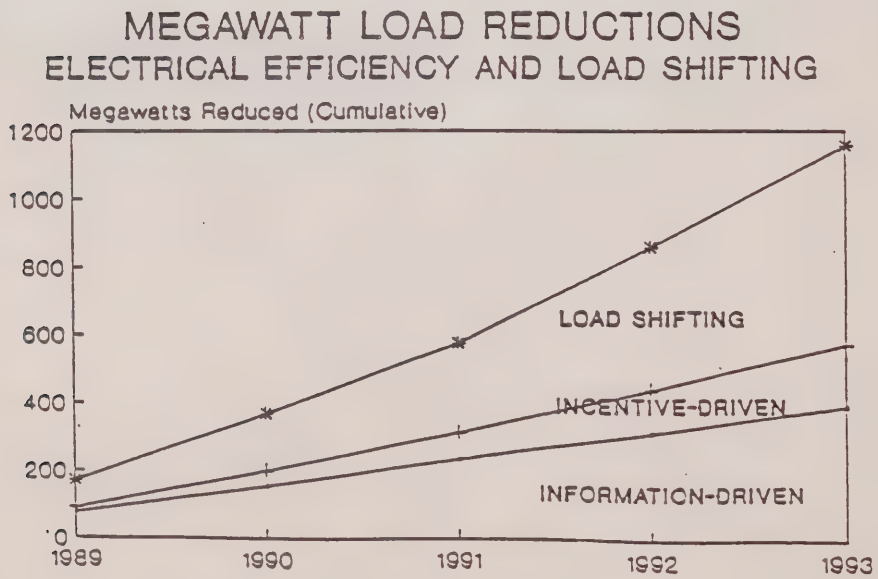
ELECTRICAL EFFICIENCY IMPROVEMENTS & LOAD SHIFTING

Sector	By 1990			By 1993			By 2000
	Information-Driven**	Incentive-Driven	Load Shifting	Information-Driven**	Incentive-Driven	Load Shifting	
Residential	6	8	2	20	37	18	
Commercial	90	22	27	225	76	182	
Industrial	58	15	140	148	70	380	
Total	199		169	576		580	4500 MW**

Source: Market Planning Department May 1988 (1989-93 Business Plan estimates)

Note: * Megawatts are cumulative. 1988 megawatt reductions are not included.

** The information and services provided by Ontario Hydro will help to ensure 1,500 MW of natural conservation takes place by 2000.



4.0 Results

4.1 A MORE ENERGY EFFICIENT ONTARIO

An aggressive pursuit of demand management contributes to Ontario Hydro's goals for customer satisfaction and long term value. It reflects our commitment to an energy efficient Ontario. The plan for **electrical efficiency improvements** delivers about 200 MW of load reduction by the end of 1990 and about 170 MW of **load shifting**. By 1993, the end of the current business planning time frame, the total is expected to be about 575 MW and 580 MW respectively (Figure 4.1). This puts Hydro on a path to achieve the target of 3,500 MW of electrical efficiency improvements and 1,000 MW of load shifting by the year 2000.

4.2 INCREASED CORPORATE FLEXIBILITY AND RELIABILITY

Demand management is an essential component of Ontario Hydro's strategy for meeting future electrical needs. Along with supply options, it will contribute to reliability of electrical supply and corporate flexibility to meet a variety of changing customer needs.

The contribution of demand reduction options such as electrical efficiency improvements and load shifting is critical to meeting the need for additional resources in the 1990's. Traditional generation options such as nuclear or coal-fired have long lead times and even if started in 1989 would not be available until about the year 2000 or beyond.

4.3 INCREASED CUSTOMER SATISFACTION

While reliability remains an essential component of customer satisfaction, customers today are differentiating between products and services on the basis of "value" added to their lifestyle or work place.

This plan contributes to increased customer value by helping them use their electricity more efficiently, informing them of electric technologies that can provide benefit to them and by offering a broadened package of products and services designed to meet their individual needs. The challenge will be to continue to develop innovative ways to match our products and services with customer needs to create the greatest net benefit.

Incentive-driven efficiency improvements will put upward pressure on rates in the short term. However, total customer costs are minimized by placing priority on the most economic demand management options first, offering the lowest incentive level necessary to influence the market, and staging initiatives so that they come on stream in a pattern that is reasonably consistent with system need.

4.4 A VISIBLE PRESENCE IN THE ENERGY MARKET

A higher profile for electrical efficiency is required in order to achieve the higher targets. Ontario Hydro recently renamed its Marketing Branch to become the Energy Management Branch. This

more closely conveys the thrust of helping customers manage their energy and electricity more efficiently.

A more visible presence in the Ontario energy marketplace is needed. This will be accomplished by undertaking the following specific initiatives in the next year:

- Communication of the energy management direction will be accomplished by aggressive advertising of electrical efficiency programs, demonstrations and promotion of achievements.

- There will be high profile lead-ins to the residential/agricultural sector programs in order to influence customer attitudes about electrical efficiency (ie. literature, advertising, bill inserts)

- An "EnerMark" energy management information store will open in Toronto promoting products and services that will provide increased electrical efficiency.

- Energy audits aimed at identifying new opportunities will be a major visible component of the industrial and commercial sector activities.

- There will be wide publicity of the introduction of Time-Of-Use rates.

APPENDIX

GLOSSARY OF TERMS

GLOSSARY OF TERMS

TERM	DEFINITION
Electrical Efficiency Improvements	
Incentive-Driven	more efficient use of electricity, stimulated by incentives
Information-Driven	more efficient use of electricity; influenced by contact and/or information (e.g. analysis of electricity bills)
Load Shifting	changed pattern of electricity use; stimulated by TOU rates or by use of direct controls
TOU or Time-of-Use Rates	differential rates based on the cost to supply power at the particular time of day season of the year (peak versus off peak, summer/winter)
Parallel Generation	non Ontario Hydro generation of electricity stimulated by buy-back rates and/or incentives (e.g. low interest loans); can be independent generation by entrepreneurs (e.g. small hydro) or cogeneration by industry
Process and Energy Efficiency Improvements (sometimes referred to as "applications" initiatives)	increased use of electric technologies in applications that provide savings to customers; stimulated by contact and information.
Comfort/Convenience Safety	increased use of electricity or maintaining its use in applications where the use of electricity meets the non-financial needs of customers; stimulated by contact and information.
Demand Management	refers to the total range of initiatives aimed at more efficient use of energy and electricity: electrical efficiency improvements, load shifting, TOU rates, and process efficiency improvements.

Source: Market Planning Department - May , 1988

Ontario Hydro
700 University Avenue
Toronto, Ontario
M5G 1X6

ATTACHMENT #3

Robert C. Franklin Chairman and President

April 29, 1988

962-00541.11 (T10)

The Hon. James Bradley
Minister of the Environment
15th Floor
135 St. Clair Avenue West
Toronto, Ontario
M4V 1P5

Dear Minister:

Thank you for the opportunity to comment on the Clean Air Program Discussion Paper. I would like to say at the outset that Ontario Hydro strongly supports and is committed to the objectives of cleaner air and a cleaner environment. I would hope that our record on cutting acid gas emissions since our peak year of 1982, together with recent initiatives launched on environmental protection, underline that commitment.

While I believe we share a common end goal, I do have concerns about Regulation 308, and would like to briefly outline these to you.

Ontario Hydro feels that the present regulation limiting our acid gas emissions -- Regulation 281/87-- protects both the environment and the interests of our customers. That's because Regulation 281/87 views our fossil-fuelled generating plants as a system rather than individual stations. I cannot stress the importance of this approach enough.

As you know, Ontario's total electricity system is large, complex, and relies on no one generating source. It must be finely balanced to meet the often competing needs of the Ontario economy. The current system overview approach to fossil fuels allows us the key advantage of flexibility in choosing the technology, timing, location, and means of meeting your Government's acid gas controls. Quite simply, it allows us to make use of the diversity of the total electricity system, including purchases of power and other generating options, to protect the environment without jeopardizing reliability.

On the other hand, Regulation 308 permits no such flexibility. It is also primarily concerned with persistent toxic air pollutants to which Ontario Hydro does not significantly contribute. Under this draft regulation, each of our fossil-fuelled units would be placed under rigid emission limits within a set time period, and I understand the means and the technology for meeting those limits may be specified.

Not only would the costs be prohibitive for our customers of meeting both Regulation 281/87 and Regulation 308 (possibly in excess of $20 billion in cumulative life-cycle costs), but the time frame for the latter Regulation is unrealistic. Installing the necessary control equipment would require major outages and could jeopardize power supply to both residential and industrial customers.

You are aware that Ontario Hydro has submitted an Environmental Assessment document seeking approval for scrubber technologies to help us meet acid gas emission limits. You are also familiar with the options included in our program to achieve cleaner air. For example, installation and operation of six scrubbers will have an estimated cumulative life-cycle cost of $2 billion. We feel this represents an investment of our customers' money in environmental protection that will achieve the results you seek, without the risk and uncertainty represented by Regulation 308.

Attached to this letter are two appendices; the first contains general comments on five significant areas that are of major concern to Ontario Hydro; the second presents a more detailed review of the Discussion Paper and its economic implications. Technical and quantitative data relating to air quality aspects of the Discussion Paper will be sent under separate cover directly to your technical staff.

The Hon. James Bradley

April 29, 1988

I would like to make one more comment and that concerns the 45-day review period for the draft regulation. I would suggest that more review time is needed to further assess the impact of this draft regulation, and to provide costing input so a province-wide cost-benefit analysis can be done. Since the basic proposals are still at an early stage, I would appreciate your serious consideration of an extension.

Sincerely,

Bob Franklin

Robert C. Franklin
Chairman and President

Attach.

cc: Hon. R. Wong
Hon. R. Nixon

bc: Mr. A. Nittenberg, H19-A22
Mr. L.E. Leonoff, H19-F27
Mr. R.W. Bartholomew, A8-A2
Mr. L.G. McConnell, H5-A27
Mr. W.G. Morison, H17-A1
Mr. E.P. Horton, A8-A4
Mr. H.S. Irvine, H15-A1
Mr. R.J. Walters, A14-A18
Mr. W.H. Winter, A5-A2
Mr. L.W. Woodhead, A8-H1
Dr. O.A. Kupcis, KR212
Dr. W.R. Effer, H10-G1
Mr. M.J. Northfield, A8-E1
Ms. K. Kinsella

APPENDIX A

A1) Relationship Between Regulation 281/87 and Proposed Regulation 308

The regulatory philosophies which have been used to develop these two Regulations differ widely. Regulation 281/87 provides Ontario Hydro with the freedom to meet acid gas emission limits in the most cost effective manner, in terms of selection, location, and timing of controls. Regulation 308, on the other hand, appears to be directed towards site specific emission limits, specific emission control technology and is subject to specific time limits.

Despite our clarification meeting on March 3, 1988, large residual uncertainty related to the relationship between Regulation 281/87 and the proposed Regulation 308 remain. Though we were told that Regulation 281/87 will be paramount, provisions of the proposed Regulation 308 appear to be able to compromise this position in the near term, ie, 5 years, which provides a very uncertain climate for planning.

Ontario Hydro can subscribe to the philosophy that local air quality may need to be improved in some areas of the Province, but cannot agree that specific emission limits and possibly imposed emission control technology are necessary steps (in the case of Ontario Hydro) to achieve this improvement. Since Ontario Hydro is currently taking steps to reduce its contribution to long range transport and the acid rain problem by complying with Regulation 281/87, we suggest that it should also be given the freedom to comply with regulatory initiatives to improve local air quality in the most cost effective manner. This should include the option to switch fuel where practicable or reduce load during adverse dispersion conditions.

A2) Implications of the Proposals to Ontario Hydro's System Planning Process

The Green Paper suggests that as a minimum Ontario Hydro would be required to limit its SO_2 and NO_x emissions to a level equivalent to the application of best available technology and may indeed be required to retrofit best available technology economically achievable (BACTEA). It is proposed that a 5-year phase in period would be allowed for compliance. The retrofit of BACTEA for NO_x and SO_2 to all of Ontario Hydro's fossil-fuelled stations within a 5-year period is beyond the resources of both Ontario Hydro and the country's air pollution engineering industry, even if the need for the air pollution control industry to respond to other industries' requirements under Regulation 308 and Ontario Hydro's obligations under the Environmental Assessment (EA) Act are ignored. The modifications necessary to achieve "emissions equivalent to BACTEA", on all our fossil-fired units, eg, very low sulphur fuel, are not technically or logistically feasible within a 5-year period. The unit outages necessary to implement modifications and tie in equipment could jeopardize the systems' ability to meet the load.

It should also be recognized that a requirement to make major modifications to a generating plant approaching the end of its useful life could make that plant uneconomic and result in its premature retirement. This will increase pressures to construct new generating capacity earlier. These older plants, as they come to the end of their serviceable life, are operated on progressively lower capacity factors and, therefore, emissions become of less importance and have little impact on local air quality.

Similarly, the added emission control requirements for industrial boilers will likely make a number of cogeneration schemes uneconomic, again adding to Ontario Hydro's need to build new generation earlier. This may be of particular importance in Northern Ontario where local cogeneration projects have been seen as having the potential to defer new hydroelectric projects and transmission lines.

A3) Economics of Implementing Major Proposals in the Green Paper

We concur with the concept of a socioeconomic evaluation being carried out. This section provides cost data which can be used in this evaluation. The term BACTEA clearly implies that some negotiation will be required between the Ministry of the Environment (MOE) and each industry to clearly define BACTEA for specific circumstances. Until this negotiation has occurred and BACTEA has been defined, it is obviously impossible to forecast, with any certainty, the costs of complying with Regulation 308. In addition, the uncertainty as to whether BACTEA will be required, or "emissions equivalent to BACTEA" adds to the uncertainty of any cost estimates.

Nevertheless, we believe that it is important that some estimate of the cost implications of the Green Paper proposals is provided so that the cost implications of the draft proposal will be more clearly understood. It should also be recognized that our program to limit acid gas emissions will result in the installation of scrubbers on the largest emitters and, therefore, the most cost effective units. The installation of scrubbers on more units will inevitably be less cost effective.

For the purpose of developing cost estimates, we have assumed that BACTEA for SO_2 emissions would be SO_2 scrubbers achieving a 95% SO_2 reduction. For NO_x control, we have estimated the costs of using Selective Catalytic Reduction to achieve a significant NO_x reduction, say 80%. Ontario Hydro does not accept this technology as being BACTEA, but we understand that Environment Canada suggests this to be the case.

The cumulative total cost of retrofitting 95% efficient SO_2 scrubbers to all Ontario Hydro's operating fossil-fuelled generating stations would be approximately $7.1 billion (or $2.3 billion present worth). This amounts to three or four times the estimated cost of our

current scrubber program to satisfy Regulation 281/87. The retrofit of 80% efficient Selective Catalytic Reduction equipment at all our fossil-fuelled generating stations, based on EPRI estimates, is between $7.9 and $15.2 billion (or $2.3 and $3.6 billion present worth). These costs are life cycle costs assuming a 16-year operating life. The range in the estimate for NO_x control reflects a catalyst life ranging from 1 to 3 years. In effect, therefore, NO_x reduction by Selective Catalytic Reduction roughly doubles the costs for SO_2 alone. Refer to Appendix 8.2 for details.

It should be recognized that compliance costs would be sufficiently large to have significant impact on the Provinces' electricity rates and, therefore, the costs of most manufactured products.

A further concern to Ontario Hydro is the proposal in the Green Paper that Certificates of Approval should be renewed every 10 years. Though we recognize the Ministry's desire to ensure the continued use of state of the art emission control technology by industry, we feel that such a provision has the potential to double or triple Ontario Hydro's atmospheric emission control costs. The emission limit/rate in the Certificate of Approval should remain valid for the operating life of the plant.

A4) Implications of Proposals for the Environmental Assessment Act

The EA document for our anticipated SO_2 scrubber program was submitted to the Minister in February 1988. In parallel with the EA, the purchase specification for the first two or possibly four units will be developed so that it can be issued for tender once the EA approval is obtained. Both the EA and purchase specification are based on an SO_2 scrubber designed to most cost effectively satisfy the requirements of Regulation 281/87.

The revisions to Regulation 308 could conceivably be promulgated after the EA approval, but before approvals under the Environmental Protection Act have been received. Thus, Ontario Hydro could find itself in the situation of having an EA approval for a scrubber design intended to satisfy Regulation 281/87, but then having to satisfy the requirements of a revised Regulation 308. In some cases, the two requirements may not be compatible, eg, selection of limestone injection technology may satisfy the requirement of Regulation 281/87, but may not satisfy the BACTEA requirement of Regulation 308. It is essential that this issue be resolved prior to our selection of technology for our first scrubber commitment in September 1988.

The EA for which we are now seeking approval covers Lambton, Nanticoke, and Lakeview and four SO_2 removal technologies. Retrofit of these technologies on new stations or new technologies, eg, NO_x control, on all our stations would also require approval under the EA Act. Such required EAs would delay tendering for equipment by 2 to 3 years.

A further issue is the question of a scrubber bypass for operational flexibility. During our clarification meeting on March 3, 1988, it was stated that units retrofitting scrubbers to satisfy the requirements of Regulation 281/87 would be expected to also satisfy Regulation 308 and this would mean no bypass. At the same time, it was agreed that units not required to retrofit scrubbers to comply with Regulation 281/87 would be permitted to continue to operate in compliance with ambient air quality standards. The net effect would be that a scrubber failure would force shutdown of the scrubbed unit and start up of a nonscrubbed unit, elsewhere in the system. Clearly this is an illogical situation which also needs to be resolved. Incidentally, you should note that the West Germans, who probably have some of the toughest air emission regulations, permit bypass. Bypass, may in fact, be a necessity to avoid damage to rubber linings by oil carry over during a cold start up.

A5) Atmospheric Dispersion Modelling

Our staff, over the past 12 to 18 months, have remained informed of developments, and have become familiar with the proposed models and modelling procedures. Some of the major concerns regarding the proposed modelling philosophy in the Clean Air Program are briefly summarized here.

In its present form, the description of the models and modelling protocols in the Green Paper document, are inadequate for inclusion as modelling specifics in a regulation. There is a marked lack of detail leaving considerable room for subjective interpretation or misinterpretation of what is required.

It is clear that to undertake the proposed modelling protocols for most of Ontario Hydro's major facilities will be a lengthy and expensive process for both Ontario Hydro and the Ministry of the Environment. This is especially the case for some of Hydro's facilities where mathematical modelling will not adequately describe the dispersion climatology. It is also evident that the models have not been extensively evaluated by the Ministry for the potential range of atmospheric and source conditions over which these models may be applied, nor has any attempt been made to assess the accuracy of prediction that the modelling package provides.

Implicit in the philosophy to include the modelling specifics in the new Regulation is the assumption that the model predictions are accurate. Mathematical simulation of the dispersal of pollutants in the atmosphere is a science, which is limited in its ability to predict probable air quality. Model agreement with observational data within a factor of two is usually accepted as good model performance. If the models are to be enshrined in the Regulation, as proposed,

modelling inaccuracy should be appropriately considered. Given the present state of the science in air quality modelling, an accuracy of 50% on the model prediction is suggested when comparisons to ambient air standards are made.

APPENDIX B

B1) Specific Comments On The Discussion Paper Text

OVERVIEW

Page i

Many of the problem areas suggested with the existing regulatory program are not resolved or discussed in the Green Paper, vis-a-vis long-range transport, long-term deposition, very short-term effects, very long-term effects, additive and synergistic effects, treatment of fugitive emissions, weaknesses in dealing with land use changes, and provisions for dealing with experimental situations. Bioaccumulation and persistence are addressed only in context of the Ranking Method (pg 9).

Why is there increased emphasis on short-term, localized air quality when the professed concerns are for long-term, long-range pollution?

Are other discussion papers in preparation at the Ministry of the Environment to consider these weaknesses with existing legislation?

Page ii

The text should make clear what is meant by "air pollution sources of any appreciable size."

Emission limits should be based on minimizing effects, not optimum performance of emission control technology. In some instances, control technology may be inadequate and, conversely, when emissions have minimal or no effects it is difficult to justify further reductions. Selection of the appropriate level of control technology should be based on the amount of emissions and the potential effects from each source, not a uniform technology for each class of emissions.

Chapter 1 - Introduction

Page 2

The Green Paper should indicate the present status of air quality in Ontario and describe impacts on the environment. This is required to establish a meaningful goal for the Clean Air Program and to describe the form and priorities of the new Regulation.

In its present form, the Green Paper suggests that merely because improved models and control technology are available, air pollution must be reduced.

Page 4

The 45-day review period for the draft Regulation seems extremely short particularly so because basic proposals are still at the early discussion stage and in several areas alternative proposals have not been formulated at all. An example is the "de minimis" concept that is not quantitatively defined.

Due to the large number of concerns we have with the present Green Paper, we suggest a third period (between these two steps) for further discussion and comment by the major stakeholders.

Chapter 2 - New Air Emission Control Strategy

Page 8

The USEPA requirement for BACTEA is only for "new sources in noncompliance situations." This is quite different from the proposed requirements for Ontario in which all sources whether new or existing and all areas whether in compliance or noncompliances are required to apply BACTEA.

What makes the proposed definition of BACTEA necessary for Ontario? The additional level of stringency is not rationalized.

Page 9

The contaminant ranking system approach is a good one, but availability of the data required to do the ranking is limited. Judgement is required in going through the process and we suggest that a team of qualified risk assessors should be involved.

The document does not specify a procedure to determine what contaminants must be controlled. We are suggesting that fuel analysis be used to calculate gas stream concentrations or emission rates to determine if the contaminants are below the "de minimis" level.

Pages 12-15

None of the options for identifying appropriate emission rates clearly define the Ministry's or industry's role in the process. The Ministry should specify emission rates based on minimizing effects, and proponents would select control equipment to meet these limits.

Page 17

The worst case model should be validated with measured concentration data to ensure that it is realistic.

For Type B(1) sources, a protocol should be provided for calculating the maximum uniform background concentration.

For Type B(1) sources, the document does not specify the nature of the further modelling requirements when "the maximum contribution plus the maximum uniform background" is greater than the standard.

Page 19

Limiting the stack height used in modelling to no more than the Good Engineering Practice rule could unfairly penalize existing operations that were designed using the rule. Also, it would introduce large errors in the modelling results. Rather than interfere with the accuracy of modelling results, appropriate control technology could be required by the Ministry irrespective of model results using the actual stack heights. Future installations using tall stacks (> 2 1/2 building height) could be prohibited by the Regulation.

Page 22

Developing air quality standards is essentially a technical function. Non-government representatives on the Environmental Air Standards Setting Committee (EASSC) should include industry, academia and consulting firms.

The Public of Ontario should be provided with concise documentation on the rationale and have the opportunity to scrutinize standards.

It is unclear why the work of the EASSC would delay issuing Certificates of Approval. Could existing criteria not continue in use until EASSC develops new standards for a given contaminant?

Since the EA process provides opportunity for public participation at the conceptual phase of a project, we are unclear why there would be a need for additional input at the Certificate of Approval stage. We are concerned that public participation at this very technical phase would introduce costly time delays.

Page 23

It is our experience that use of the extrapolation/intrapolation method (Appendix C) for calculating contaminant levels for the standard averaging time from mobile monitoring data is only valid for very stable atmospheric conditions. Based on mobile monitoring data for Lakeview TGS, this technique does not work.

Chapter 3 - Proposals for Implementation

Page 26

The MOE should specify accepted protocol for designing fixed monitor networks.

Page 27

The phasing-in process to existing facilities should not be constrained to a 5-year time limit. In the case of retrofitting SO_2 scrubbers at existing fossil-fired generating units, this is a major undertaking in terms of cost, materials and manpower. It may well take 10 to 15 years to complete this task.

Phasing-in proposals for emission control systems should be on the basis of first selecting those priority pollutants which give rise to major air quality concerns. This is stated in the "Explanation Notes" quite clearly but elsewhere in the Green Paper the subject of phasing-in is confusing. In areas where industries have maintained good air quality, there should be no immediate priority to retrofit control equipment.

It is stated that applications for Certificates of Approval for new sources are to be required under the new Regulation immediately following promulgation. An exception is made where the proposed measures are deemed improvements to existing operations. How does this relate to the Countdown Acid Rain Program where SO_2 scrubbers are to be installed as improvements to reduce emissions?

Planned changes to existing operations to significantly reduce emissions may be expedited through the approval process if the four stated conditions are met. The third condition may be prohibitive because, over time, a limited number of exceedances may occur during adverse meteorological conditions even after installation of state of the art control equipment.

Facilities constructed before the Certificate of Approval process was initiated should not be required to immediately comply with the new Regulation.

From time to time, experiments may be conducted at Ontario Hydro stations to test emission control technologies or test performance of existing emission control systems with various fuels. The MOE should be able to grant permission to proceed with such tests without requiring an Application for a Certificate of Approval.

Page 29

The preconditions to extending a supplementary control program are unnecessary. Rather, we suggest it would be useful to first consider the control equipment installed at such facilities and the impact of any exceedances during adverse meteorological conditions.

For situations when modelling indicates exceedances, supplementary control systems, without the requirement for upgraded control technology, should be allowed to prevent those infrequent occurrences of poor air quality due to adverse meteorological conditions. A supplementary control system has been used successfully at Lakeview TGS for several years.

Page 30

The combination "de minimis" approach that would recognize the validity of exempting both low concentration sources and low total emission sources from the Regulation would be our preference.

Page 31

A major installation, such as an SO_2 scrubber which is very costly, complex to operate and occupies large amounts of space comparable to the generating station itself, should be discounted over the remaining operating life of a generating station. In many instances, this would represent a period of between 15 to 30 years. The Green Paper appears to suggest that such major equipment be depreciated over 10 years.

Renewal of Certificates of Approval every 10 years seems to have been selected as a compromise value. The frequency of the automatic re-examination should take into consideration a reasonable amount of time to depreciate the capital costs of the control equipment. Furthermore, requirements arising from the re-examination should be cost effective, based on the incremental costs incurred and the improvement to local air quality.

Pages 33 - 34

The provision of a meteorological and source data for complex [Type 8(2)] situations should be provided as a free-of-charge service by the Ministry. This information is required before the draft Regulation is produced to allow evaluation of economic and operational impacts.

As opposed to multi-source modelling, we consider that the use of a calculated background concentration should be allowed for complex situations. A calculation protocol should be provided by the Ministry.

The Ministry needs to provide a methodology to compute long and short-term averages from modelled data before the draft Regulation is issued to allow for economic evaluations.

The Ministry should update the present emission/source inventory before requiring industry to comply with the new Regulation. This will prevent a requirement to upgrade control equipment due to inaccuracies of multi-source model input data.

The new models are significantly more complex than the existing models. As a result, the licensing process will be substantially more time consuming. The Ministry should provide direction on using the models for Certificate of Approval applications and for performing pre-engineering evaluations.

A rule should apply for determining an acceptable return period for screening maximum hourly calculated concentrations. High concentration episodes can occur intermittently from any size source even with control equipment. When the episodes are short in duration, and are not associated with appreciable effects and have a long return period, they should not be considered infractions of the regulatory standard. This will help guard against overly conservative model results being used in making major regulatory decisions based on calculated results for rare dispersion events.

Chapter 4 - Other Measures

Page 36

The AQI is an improvement over the API. Maintaining two indices may be confusing to the Public, especially when they provide conflicting indications, eg, a high AQI due to ozone may occur during periods of low API.

Page 38

The proposals on opacity regulations are stringent. We do not believe that trained non-government observers should have enforcement power as this practice could very well lead to abuses of the process by individuals who may have other motives.

By necessity, certain operations at our thermal generating stations result in opacities greater than 20% for short periods (eg, sootblowing). If the Ministry eliminates the 40% opacity exemption from the Regulation, we must be involved in the development of the proposed averaging period to cover these operations.

Page 39

The Ministry should provide to industry a list of acceptable opacity monitors and other continuous monitoring equipment.

Page 42

The Ministry should discuss with industry the necessity of retaining Section 9 in the Regulation.

Chapter 5 - Other Issues

Page 47

The Guidelines for open burning should be reviewed in draft format with industry. Safety regulations require Ontario Hydro to conduct fire training exercises and these must be permitted to continue. Opacity requirements in their present form may prohibit such exercises at Ontario Hydro or other private/municipal fire training facilities.

APPENDIX 8.2

ECONOMICS OF MAJOR PROPOSALS IN THE GREEN PAPER

In the discussion paper, SO_2 and NO_x are identified as BACTEA pollutants. For the purpose of providing cost estimates, we have assumed that BACTEA for SO_2 would require installation and operation of 95% efficient flue gas desulphurization systems (FGD). For NO_x, we understand that Environment Canada believes BACTEA to be Selective Catalytic Reduction (SCR). We do not accept this position, but for illustrative purposes have presented the costs for a complete system retrofit of FGD and SCR. The scenarios considered are:

1. Our current estimate of the FGD requirements (6 x 500 MW Units) to meet Regulation 281/87.

2. Complete system retrofit of FGD except for RL Hearn TGS which is assumed to burn gas. (32 units retrofitted with FGD.)

3. Complete system retrofit of SCR, including RL Hearn TGS (40 units retrofitted with SCR.)

The economics presented include capital costs escalated to the year of installation and interest during construction added to the year in-service. Operating and maintenance costs are escalated to the year of cash flow. Present worth costs are determined by discontinuing these costs back to January 1, 1987. A 16 year operating period, ending in 2009, is assumed.

	Cumulative Life Cycle Cost	Discounted Life Cycle Cost (1987 Present Worth)
	$ x 10^9	$ x 10^9
6 FGD Systems (for Reg 281/87)	2.1	0.6
32 FGD Systems (for Reg 308)	7.1	2.3
40 SCR Systems (for Reg 308)		
- 1 year Catalyst Life	15.2	3.6
- 3 year Catalyst Life	7.9	2.1

Details of these estimates are provided in Tables 1 to 4 attached.

As might be expected, the Regulation 308 measures are significantly less cost effective, in terms of dollars per Mg of acid gas removed, than the Regulation 281/87 measures. This is demonstrated in the following table.

	Discounted Life Cycle Cost (1987 Present Worth)	Acid Gas Removed by 2009	Cost/Mg SO_2 or Equivalent (H+ Equiv Basis)
	$ x 10^9	Mg x 10^6	$/Mg (1987)
6 FGD Systems (for Reg 281/87)	0.6	3.110	199
32 FGD Systems (for Reg 308)	2.3	6.545	358
40 SCR Systems (for Reg 308)			
- 1 year Catalyst Life	3.6	0.647	5189
- 3 Year Catalyst Life	2.1	0.647	3096

Table 1

FGD CASH FLOW (M$) --- LIMESTONE (NON-REGEN) PROCESS FOR (N) FOSSIL-FUEL-FIRED THERMAL GENERATING STATIONS*

3% S Coal (Design), 2.5% S Coal (Average), 95% SO2 Removal, 96.5% Operability, 16-year service life

YR	CAPITAL COST (1987 M$) 12 FGD U/S IN 1994	12 FGD U/S IN 1995	0 FGD U/S IN 1996	CONST TOTAL (1987 M$)	ESC RATE	CUMUL. ESC RATE	ESC TOTAL	INT RATE	INT	YEARLY TOTAL	CUMUL. TOTAL	ANNUAL O&M	ANNUAL CASH FLOW	CUMUL. CASH FLOW	CUMUL. O&M PRESENT VALUE (1994 M$)
	1161.4	761.9	489.9												
87				0	1.000	1.000	0	10.2							
88				0	1.047	1.047	0	10.5							
89				0	1.050	1.099	0	10.9	0	0	0				
90	0.10	0.00	0.00	116	1.061	1.166	135	10.3	7	142	142		142	142	
91	0.30	0.10	0.00	425	1.065	1.242	527	9.8	10	567	710		567	710	
92	0.45	0.30	0.10	800	1.065	1.323	1059	9.8	121	1180	1890		1180	1890	
93	0.15	0.45	0.30	661	1.065	1.409	936	9.8	231	1167	3056		1167	3056	
94		0.15	0.45	335	1.065	1.501	502	9.8	142	644	3700	75	718	3775	
95			0.15	73	1.065	1.598	117	9.8	64	101	3802	115	297	4071	67
96				-----	1.060	1.694	-----					143	143	4214	162
97				2413	1.060	1.796	3277					151	151	4365	260
98					1.060	1.903						160	160	4526	369
99					1.060	2.018						170	170	4696	466
000					1.060	2.139						180	180	4876	560
001					1.060	2.267						191	191	5067	649
002					1.060	2.403						202	202	5269	735
003					1.060	2.547						215	215	5483	817
004					1.060	2.700						227	227	5711	896
005					1.060	2.862						241	241	5952	972
006					1.065	3.048						257	257	6209	1045
007					1.065	3.246						273	273	6482	1114
008					1.065	3.457						291	291	6773	1181 (M$)
009					1.065	3.682						310	310	7083	1245 DISCOUNTED LCC
															1307 2513 (1987 PW)

NOTES:

1. ONTARIO HYDRO COST ESCALATORS --- CONSTRUCTION COMPOSITE COST INDICES (FOSSIL), FEBRUARY 1, 1988
2. ONTARIO HYDRO INTEREST RATES (LONG), FEBRUARY 1, 1988.
3. * ONTARIO HYDRO'S THERMAL GENERATING STATIONS ARE LAMBTON, NANTICOKE, LAKEVIEW, THUNDER BAY, ATIKOKAN, LENNOX, NEARN AND KEITH. IT IS ASSUMED THAT NEARN WILL BURN NATURAL GAS, IF IT COMES INTO SERVICE. THEREFORE, FGD COST ESTIMATES FOR NEARN WERE NOT INCLUDED IN THIS CASH FLOW.
4. 12 FGD UNITS ARE INSTALLED AT LAMBTON AND NANTICOKE FOR 1994 IN-SERVICE.
   12 FGD UNITS ARE INSTALLED AT LAKEVIEW, THUNDER BAY AND ATIKOKAN FOR 1995 IN-SERVICE.
   0 FGD UNITS ARE INSTALLED AT LENNOX AND KEITH FOR 1996 IN-SERVICE.

Table 2

SCR CASH FLOW (M$) --- SELECTIVE CATALYTIC REDUCTION PROCESS FOR ALL FOSSIL-FUEL FIRED THERMAL GENERATING STATIONS

1-Year Kill Catalyst Life, 80% NO Removal, 3% S Coal (Design), 2.5% S Coal (Average), 95% SO2 Removal, 96.5% Operability

YEAR	CAPITAL COST (1987 M$) 12 SCR U/S IN 1994	12 SCR U/S IN 1995	16 SCR U/S IN 1996	CONST TOTAL (1987 M$)	ESC RATE	CUMUL. ESC RATE	ESC TOTAL.	INT RATE	INT	YEARLY TOTAL	CUMUL. TOTAL	ANNUAL O&M	ANNUAL CASH FLOW	CUMUL CASH FLOW	CUMUL. O&M PRESENT VALUE (1994 M$)	
	632.1	414.2	465.0													
1987				0	1.000	1.000	0	10.2								
1988				0	1.047	1.047	0	10.5								
1989				0	1.050	1.099	0	10.9	0	0	0					
1990	0.10	0.00	0.00	63	1.061	1.166	74	10.3	1	70	70		70	70		
1991	0.30	0.10	0.00	231	1.065	1.242	207	9.8	22	309	386		309	386		
1992	0.15	0.30	0.10	155	1.065	1.323	602	9.8	67	670	1056		670	1056		
1993	0.15	0.15	0.30	121	1.065	1.409	593	9.8	133	726	1782		726	1782		
1994		0.15	0.15	272	1.065	1.501	100	9.8	93	501	2283	259	760	2541		
1995			0.15	70	1.065	1.598	112	9.8	63	175	2457	411	586	3127	234	
1996				-----	1.060	1.694	-----					572	572	3699	571	
1997				1512	1.060	1.796	2076					606	606	4306	995	
1998					1.060	1.903						643	643	4949	1402	
1999					1.060	2.018						681	681	5630	1792	
2000					1.060	2.139						722	722	6352	2166	
2001					1.060	2.267						766	766	7118	2525	
2002					1.060	2.403						812	812	7929	2870	
2003					1.060	2.547						860	860	8790	3200	
2004					1.060	2.700						912	912	9701	3517	
2005					1.060	2.862						967	967	10668	3821	
2006					1.065	3.048						1029	1029	11697	4112	
2007					1.065	3.246						1096	1096	12794	4391	
2008					1.065	3.457						1168	1168	13961	4659	(M$)
2009					1.065	3.682						1243	1243	15205	4916	DISCOUNTED ICC
															5162	3500 (1987 M$)

NOTES:

1). ONTARIO HYDRO COST ESCALATORS --- CONSTRUCTION COMPOSITE COST INDICES (FOSSIL), FEBRUARY 1, 1988

2). ONTARIO HYDRO INTEREST RATES (LONG), FEBRUARY 1, 1988.

3). ONTARIO HYDRO'S THERMAL GENERATING STATIONS ARE LAMBTON, NANTICOKE, LAKEVIEW, THUNDER BAY, ATIKOKAN, LENNOX, HEARN AND KEITH. ALL OF THEM ARE RETROFITTED WITH SCR UNITS.

4). 12 SCR UNITS ARE INSTALLED AT LAMBTON AND NANTICOKE FOR 1994 IN-SERVICE.
12 SCR UNITS ARE INSTALLED AT LAKEVIEW, THUNDER BAY AND ATIKOKAN FOR 1995 IN-SERVICE.
16 SCR UNITS ARE INSTALLED AT LENNOX, HEARN AND KEITH FOR 1996 IN-SERVICE.

Table 3

SCR CASH FLOW (M$) --- SELECTIVE CATALYTIC REDUCTION PROCESS FOR ALL FOSSIL-FUEL-FIRED THERMAL GENERATING STATIONS

3-Year NOX Catalyst Life, 80% NO Removal, 3% S Coal (Design), 2.5% S Coal (Average), 95% SO2 Removal, 96.5% Operability

	CAPITAL COST (1987 M$)													
	12 SCR	12 SCR	16 SCR									ANNUAL	CUMUL	CUMUL
YR	I/S IN 1994	I/S IN 1995	I/S IN 1996	CONST TOTAL	ESC RATE	CUMUL ESC RATE	ESC TOTAL	INT RATE	INT	YEARLY TOTAL	CUMUL TOTAL	ANNUAL O&M	CASH FLOW	CASH FLOW	O&M PRESENT VALUE
	632.1	414.2	165.8	(1987 M$)											(1994 M$)
87				0	1.000	1.000	0	10.2							
88				0	1.047	1.047	0	10.5							
89				0	1.050	1.099	0	10.9	0	0	0				
90	0.10	0.00	0.00	63	1.061	1.166	74	10.3	1	78	78		78	78	
91	0.30	0.10	0.00	231	1.065	1.242	287	9.8	22	309	386		309	386	
92	0.45	0.30	0.10	455	1.065	1.323	602	9.8	67	670	1056		670	1056	
93	0.15	0.45	0.30	421	1.065	1.409	593	9.8	133	726	1782		726	1782	
94		0.15	0.45	272	1.065	1.501	408	9.8	93	501	2283	110	611	2393	
95			0.15	70	1.065	1.598	112	9.8	63	175	2457	174	349	2741	99
96				-----	1.060	1.694	-----					245	245	2986	242
97				1512	1.060	1.796	2076					259	259	3246	423
98					1.060	1.903						275	275	3520	597
99					1.060	2.018						291	291	3812	764
00					1.060	2.139						309	309	4121	924
01					1.060	2.267						327	327	4448	1078
02					1.060	2.403						347	347	4795	1225
03					1.060	2.547						368	368	5163	1367
04					1.060	2.700						390	390	5553	1502
05					1.060	2.862						413	413	5967	1632
06					1.065	3.048						440	440	6407	1757
07					1.065	3.246						469	469	6876	1876
08					1.065	3.457						499	499	7375	1991 (M$)
09					1.065	3.682						532	532	7907	2101 DISCOUNTED LCC
															2206 2141 (1987 PW)

NOTES:

1. ONTARIO HYDRO COST ESCALATORS --- CONSTRUCTION COMPOSITE COST INDICES (FOSSIL), FEBRUARY 1, 1988
2. ONTARIO HYDRO INTEREST RATES (LONG), FEBRUARY 1, 1988.
3. ONTARIO HYDRO'S THERMAL GENERATING STATIONS ARE LAMBTON, NANTICOKE, LAKEVIEW, THUNDER BAY, ATIKOKAN, LENNOX, NEARN AND KEITH. ALL STATIONS ARE RETROFITTED WITH SCR UNITS.
4. 12 SCR UNITS ARE INSTALLED AT LAMBTON AND NANTICOKE FOR 1994 IN-SERVICE.
   12 SCR UNITS ARE INSTALLED AT LAKEVIEW, THUNDER BAY AND ATIKOKAN FOR 1995 IN-SERVICE.
   16 SCR UNITS ARE INSTALLED AT LENNOX, NEARN AND KEITH FOR 1996 IN-SERVICE.

Table 4

FGD CASH FLOW (M$) --- LIMESTONE DUAL ALKALI PROCESS RETROFITTED TO LAMBTON AND NANTICOKE GS

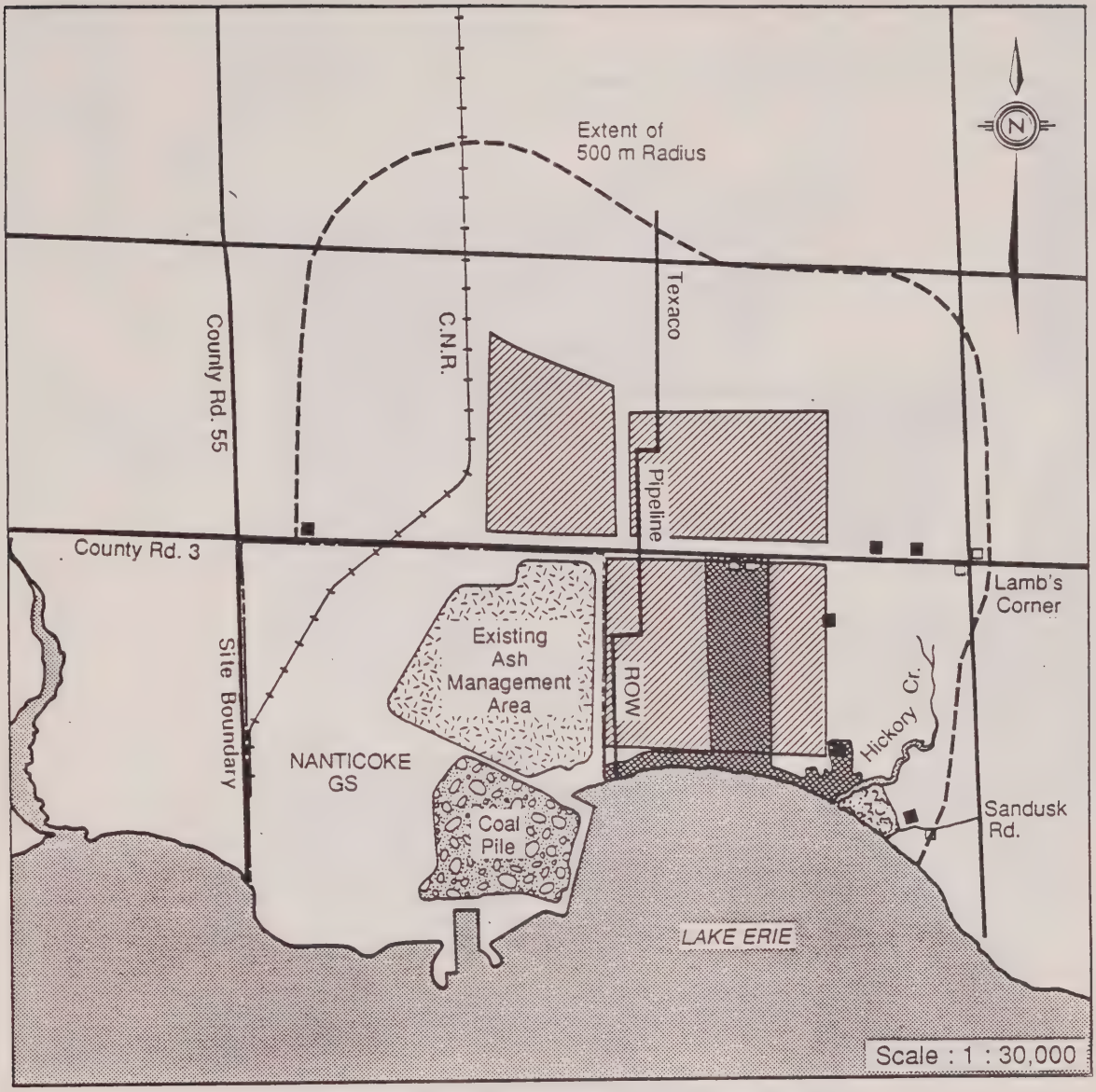
3% S Coal (Design), 2.5% S Coal (Average), 95% SO2 Removal, 96.5% Operability

YR	CAPITAL COST (1987 M$) 2 FGD U/S IN 1994	0 FGD U/S IN 1995	2 FGD U/S IN 1996	2 FGD U/S IN 1997	CONST TOTAL	ESC RATE	CUMUL ESC RATE	ESC TOTAL	INT RATE	INT	YEARLY TOTAL	CUMUL TOTAL	ANNUAL O&M	ANNUAL CASH FLOW	CUMUL CASH FLOW	CUMUL O&M PRESENT VALUE
	223.3	0.0	142.9	242.4	(1987 M$)											(1994 M$)
87					0	1.000	1.000	0	10.2							
88					0	1.047	1.047	0	10.5							
89					0	1.050	1.099	0	10.9	0	0	0				
90	0.10	0.00	0.00	0.00	22	1.061	1.166	26	10.3	1	27	27		27	27	
91	0.30	0.00	0.00	0.00	67	1.065	1.242	83	9.8	7	90	117		90	117	
92	0.45	0.00	0.10	0.00	115	1.065	1.323	152	9.8	19	171	288		171	288	
93	0.15	0.00	0.30	0.10	101	1.065	1.409	142	9.8	35	177	465		177	465	
94		0.00	0.45	0.30	137	1.065	1.501	206	9.8	10	221	689	18	241	706	
95			0.15	0.45	131	1.065	1.598	209	9.8	40	249	938	19	267	974	16
96				0.15	36	1.060	1.694	62	9.8	34	96	1033	34	130	1104	31
97					-----	1.060	1.796	-----					52	52	1157	57
98					609	1.060	1.903	879					56	56	1212	92
99						1.060	2.018						59	59	1271	126
00						1.060	2.139						62	62	1333	150
01						1.060	2.267						66	66	1400	169
02						1.060	2.403						70	70	1470	219
03						1.060	2.547						74	74	1544	247
04						1.060	2.700						79	79	1623	275
05						1.060	2.862						84	84	1707	301
06						1.065	3.048						89	89	1796	326
07						1.065	3.246						95	95	1890	350
08						1.065	3.457						101	101	1991	374 (M$)
09						1.065	3.682						108	108	2099	396 DISCOUNTED LCC
																417 620 (1987 PV)

NOTES:

1. ONTARIO HYDRO COST ESCALATORS --- CONSTRUCTION COMPOSITE COST INDICES (FOSSIL), FEBRUARY 1, 1988
2. ONTARIO HYDRO INTEREST RATES (LONG), FEBRUARY 1, 1988.
3. UNDER CURRENT FORECAST, THE FIRST AND SECOND PAIR OF FGD UNITS WILL BE RETROFITTED TO LAMBTON IN 1994 AND 1996 RESPECTIVELY. THE THIRD FGD PAIR WILL BE RETROFITTED TO NANTICOKE IN 1997.

ATTACHMENT #4

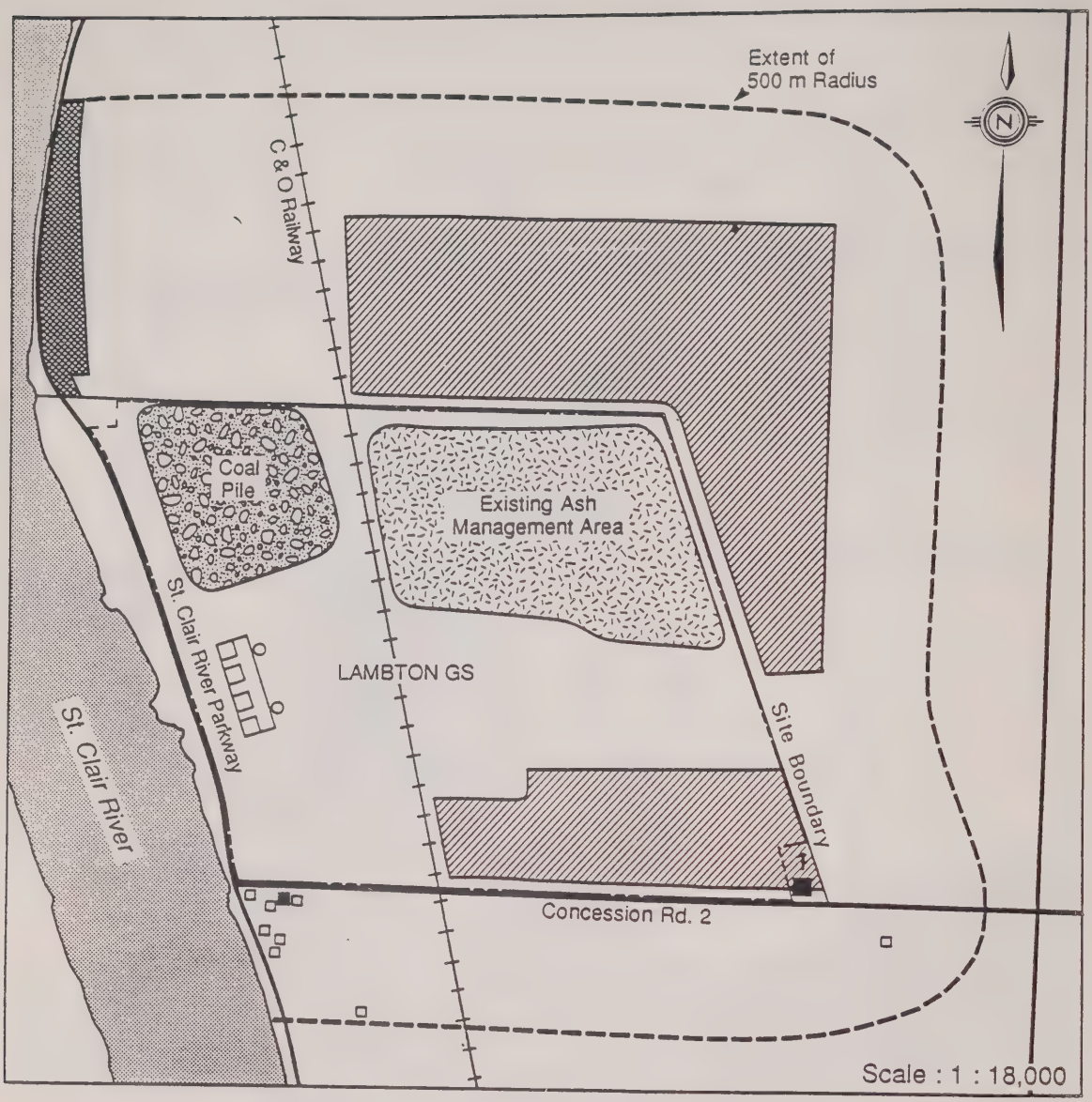


SENSITIVE USES WITHIN 500 m RADIUS OF NANTICOKE GS PROPOSED FGD WASTE AREAS

LEGEND

- Houses Privately - Owned
- Farm Buildings
- Area covered by OH-24/2
- Campground with 11 Cottages
- Proposed Waste Disposal Areas

04363



SENSITIVE USES WITHIN 500 m RADIUS OF LAMBTON GS PROPOSED FGD WASTE AREAS

LEGEND

- Houses
- Farm Buildings
- 1 Autowreckers - No Residents
- 19 Houses, 8 Farms
- Proposed Waste Disposal Areas

04362

ATTACHMENT #5

Set up 1988 file
Contact Hydro

June 23, 1988

Ontario Hydro,
700 University Avenue,
Toronto, Ontario
M5G 1X6

Attention: Ms. Sheelagh Lawrance,
Sr. Community Relations Officer
Design & Development - Transmission

Re: Ontario Hydro - Flue Gas Desulphurization Program
Environmental Assessment - Dated February, 1988
Lambton Generating Station

Dear Ms. Lawrance:

Further to your conversations earlier this year with our Reeve, Mr. Charles S. Nisbet at the Open House held at the Moore Sports Complex, please be advised that in the opinion of the Council of the Township of Moore, you have addressed the concerns raised at previous Open Houses and discussions, further to our letter of June 11th, 1987 in regard to the location of the waste disposal sites for the Lambton Generating Station Flue Gas Desulphurization Program.

It will still be necessary for Ontario Hydro to make application to the Council of the Township of Moore to have the Official Plan amended and the Zoning By-law amended in due course.

We trust this is the information you require.

Yours truly,

R. H. Whitman, A.M.C.T.
Clerk

RHW/yg

c.c. Malcolm Boyd, County Planning Director

D. Green

250

ontario hydro

700 University Avenue, Toronto, Ontario M5G 1X6

July 19, 1988

File No.: 962-FGD-00540 T3

Mr. D. Neufeld, Planner
Land Use Planning Unit
Environmental Approvals Branch
135 St. Clair Ave. W.
Toronto, Ontario M4V 1P5

Dear Dave:

RE: ONTARIO HYDRO'S FGD EA - SUPPLEMENTAL LAND USE INFORMATION

Per our June 15, 1988 meeting, we have reviewed the existing and proposed land use information for a 500 metre radius around the proposed waste disposal sites at Lambton and Nanticoke GS's. Land use maps and 1988 aerial photos for the two areas are supplied for your information.

Lambton

There are only a few structures within close proximity to the proposed FGD waste disposal sites at Lambton GS. A barn, an autowrecker yard, and one residence are located south and east of the existing site. The autowreckers will likely be purchased as part of the waste site development (this is strongly supported by Moore Township). A number of residences are located within the 500 metre radius along the river north and south of the existing station site. Our modelling results (Wong, 1988) indicate that it is unlikely that dust from the expanded waste disposal site will have an adverse effect on adjacent properties. Noise levels should also not be a problem. It is worth noting that we have recently received an endorsement from Moore Township regarding our proposed waste sites at Lambton GS. (See attached letter.) Much of the surrounding land is designated Industrial in the Official Plan and is compatible with waste site use. Re-zoning of a small area (18 ha) of Agricultural designated land at the northeast corner of the proposed disposal sites (see Figure 5-2 in FGD EA) will be required.

Nanticoke

There are 3 permanent residences, a few farm buildings, and a number of seasonal dwellings within 500 metres of the proposed FGD waste disposal sites at Nanticoke. One residence (Dennis property) would be displaced by the proposed sites. Purchase of this residence and adjoining property (about 40 ha) is already covered by an existing Exemption Order (OH-24/2) under the EA Act and negotiations are currently being conducted with the land owner. Purchase of all seasonal dwellings along the lakefront and a farm west of Hickory Creek are also covered by OH-24/2. Most of the cottages have already been purchased by Ontario Hydro. Only 4 remain privately owned. Purchase of properties is on a willing seller basis and is to provide a buffer from existing site operations at Nanticoke. A seasonal cottage camp east of Hickory Creek and two residences at Lamb's Corners are also within the 500 metre radius; however, our modelling of off-site dustfall suggests that dust levels at these distances would routinely be well within regulatory limits (see Wong, 1988, supplied to J. Toth on June 9, 1988).

Further residential development in the area adjacent to these proposed waste sites is unlikely given the existence of the Nanticoke Industrial Influence Area that recommends restricting such development for a three kilometre radius around the Nanticoke Industrial Complex (see Figure 5-11 in FGD EA). Most of the land proposed for the waste site is zoned Industrial. A portion of Site A (40 ha - the Dennis farm) is zoned Agricultural.

I trust this information satisfies your request for supplemental information regarding land use impacts at the proposed disposal sites at Lambton and Nanticoke GS's. This information will be incorporated in possible future revisions to the EA document, once the full review is completed. Detailed and site-specific mitigation measures will be developed for these sites during the ensuing Project Implementation Process (PIP) for installation of scrubbers at Lambton and/or Nanticoke. You will be invited to participate in these PIP studies, which will likely start in the fall of this year.

Please call Diane Barker (592-8591) or myself (592-6007), if you require additional information or clarification.

Yours truly,

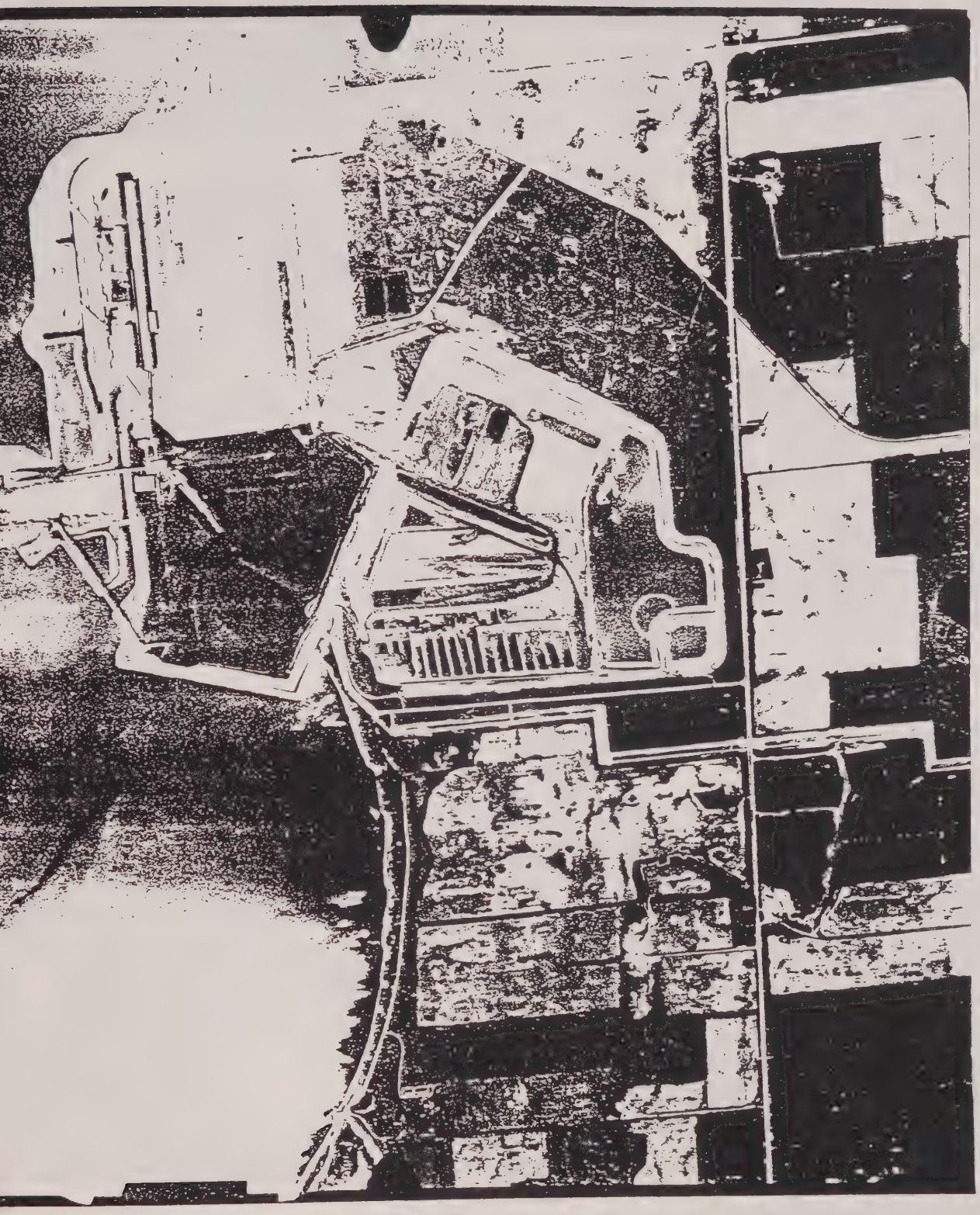
W. M. Paterson
FGD EA Coordinator
Environmental Studies & Assessments Department
H10 G03

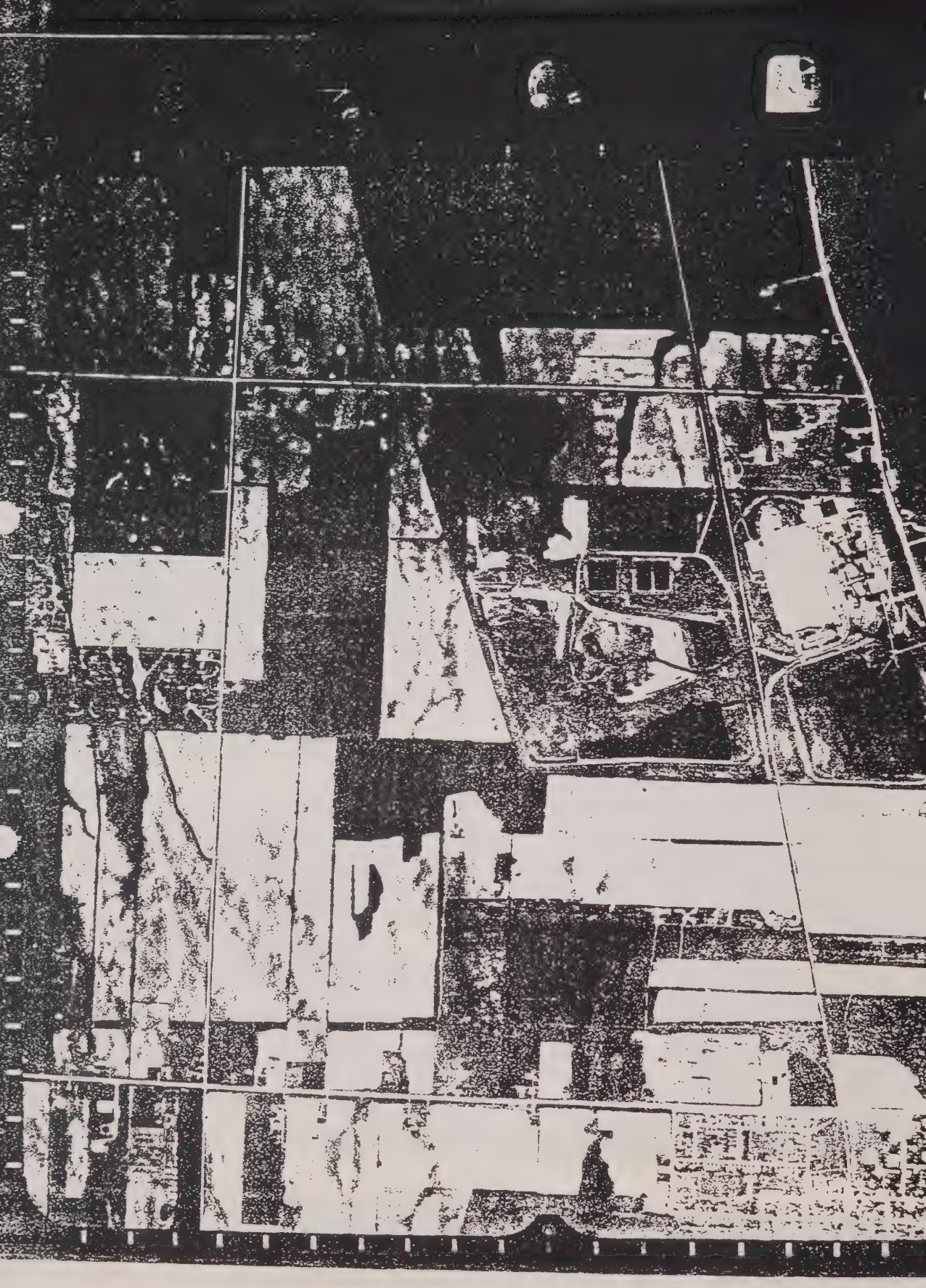
enclosures
cc J. Toth - MOE, Environmental Approvals Branch
W. Green - MOE, Environmental Approvals Branch

AERIAL PHOTOS

#OH88103-21	Nanticoke GS and vicinity
#OH88103-08	Nanticoke GS and vicinity
#OH88103-11	Nanticoke GS and vicinity
#OH88102-16	Lambton GS and vicinity

NOTE: Colour Air Photos sent to D. Neufeld only





Attachment #5 July 20, 1988

ENVIRONMENT CANADA

MINUTES OF MEETING

DATE: June 8, 1988

TIME: 09:30 - 12:30 am

LOCATION: Arthur Meighan Building
25 St. Clair Avenue East
7th Floor Boardroom

PRESENT:		
	P. Finlay	Env Canada - Ottawa
	G. Ross	Env Canada - Ottawa
	J. Shrives	Env Canada - Ottawa
	K. Shikazi	Env Canada - Ontario Region
	W. Green	MOE - EA Branch
	B. Malvern	Ontario Hydro
	G. Ezers	Ontario Hydro
	M. Paterson	Ontario Hydro

PURPOSE OF MEETING

The meeting was called by Ontario Hydro (OH) to respond to Environment Canada's (EC) comments on the FGD EA (S. Llewellyn to W. Green, April 20, 1988), and attempt to resolve outstanding issues. This will assist the MOE in preparing their formal EA Review.

FGD EA PROCESS OVERVIEW

In reviewing EC's comments, OH stated that it appeared that there may be some misunderstanding as to what OH is asking approval for in this EA document. A brief overview of the EA process for the FGD Program was given to help clarify OH's intent (copies of overheads attached).

The following points were emphasized by OH:

* The FGD EA is an individual EA for a program of activities to retrofit FGD facilities.

* The approach taken was an attempt to provide flexibility to deal with future uncertainties in terms of when and where FGD may be needed by OH to meet its acid gas control commitments per Regulation 281/87 under the Environmental Protection Act. The EA also provides flexibility in the types of FGD processes used.

* The EA is a planning document that demonstrates the environmental acceptability of an undertaking not regulatory compliance. Compliance is assured in the subsequent permitting and licensing phase under various pertinent environmental legislation.

* Approval is being requested for installing any one of four candidate technoclogies at three OH generating station sites subject to a process to implement individual projects (i.e., a specific technology at a site) - the PIR process (Chapter 8).

* A procedure to amend the EA to include new technologies and/or new generating station site is also included (Chapter 9).

* The PIR process is a part of the EA process and must be followed by OH in implementing all FGD projects, otherwise the EA Act approval is void. Government and public involvement in this process is mandatory as outlined in Figure 8-1 in the EA. While a "bump up" provision is not provided during the PIP, it is recognized that the Minister could decide to have a hearing on any "project".

* The PIR document will deal with project-specific conditions, design and mitigation measures. Further permitting and licensing will also be required under other legislation for FGD system components (e.g., Environmental Protection Act).

* The PIR consultation process for the first FGD units will likely be initiated in the fall of 1988 when a decision on the site and process are made; noting that no facility commitment can be made until the EA is approved.

EC responded that:

* The EA document did not make a specific commitment to mitigation measures.

* Commitment to comply with regulations was not necessarily the same as commitment to mitigation measures (See also 1.4).

* It was not necessary to wait until the PIR and licensing stages before making commitments to specific environmental protection requirements.

* Because the PIR process begins <u>after</u> the FGD site and process has been selected, commitments to meet specific environmental protection requirements which are to influence the FGD selection should be made <u>now</u>.

* It is important to note that not withstanding the EA "Program" approval at this time, nothing precludes EA hearings once a specific FGD project has been decided by OH (see Figure 8-1 in EA).

* Commitments to mitigative measures should form the basic terms of reference for the PIR and as such should be included in the EA.

* Environment Canada's concerns were similar to many of those expressed by the Ontario provincial agencies.

ENVIRONMENT CANADA'S CONCERNS

It was decided that EC's concerns could best be reviewed by going through the section titled "Major Comments" in the April 20, 1988, letter to MOE.

1.1 Scope

EC The EA is extensive and comprehensive within its stated scope.

1.2 Purpose

EC The importance of the OH FGD program in the Canadian Acid Rain Control strategy was emphasized. No exemption should be granted for FGD installation because of invalid assumptions or invalid electrical growth projections made in the EA by OH.

OH The EA, as submitted, provides flexibility to deal with a range of load growth scenarios. Adequate flexibility is provided to deal with the critical mid to late 1990's period. An exemption request is not contemplated.

1.3 Consultation

EC EC appreciated the invitation to comment on the draft and final EA's. Unfortunately, a meeting between OH and EC prior to the submission of the EA could not be arranged at a mutually convenient time.

EC was concerned that the approval of the FGD EA gave OH blanket approval to install the candidate technologies in any manner they wished - without any commitment to appropriate mitigation measures and appropriate input from government and public. EC in their reviews of the EA, tried to indicate what they considered to be appropriate environmental protection practices for FGD systems and that this review would help hasten the installation of FGD in Canada, by establishing "bottom-line" expectations and commitments early in the EA and the FGD system selection and design processes.

OH The meeting requested by EC to discuss their comments on the draft EA (in November 1987) came at the time OH was finalizing the document for internal approval.

As noted in the FGD EA process overview presented earlier, there is implicit provision for government and public involvement and notification in the PIR process. Opportunities "to influence environmental protection practices" will be provided as part of reviewing OH's detailed and specific project proposals. EC's comments will be used to guide the design of future projects.

1.4 Commitment to Mitigation Measures

EC The lack of commitment by OH to specific mitigation measures in the EA is a major concern. Environment Canada noted that many generic mitigation measures have been identified in the Design Phase Code of Practice and are sufficiently general and could be committed to now in the EA document before a specific FGD process is selected for a specific site. For example, does a system produce stable or thixotropic waste? Is it compatible with modular development of a disposal site and zero discharge of process wastewater? Is waste suitable for commercial by-product rather than waste generation, etc?

OH As noted by EC, the EA recognizes the major impacts and associated mitigation for FGD retrofit. Until a specific project is defined, it is not possible to identify and commit to specific mitigation measures. These will be developed at the PIR stage in consultation with government and the public.

MOE W. Green noted that MOE's judgement on acceptability of the EA (relative to Section 5(3) of the EA Act) looks at whether the potential impacts are either dealt with in the EA or if a mechanism is provided to deal with them later in the process. The PIR process appears to be an acceptable mechanism, but he is reviewing it again to see if any clarification is required.

1.5 Consistency with Environment Canada's Environmental Codes of Practice for Steam Electric Power Generation (SEPG)

EC While OH has made a commitment "to ensure consistency" with these Codes, there is a lack of commitment in the document to follow many of the specific recommendations of the Codes, particularly with respect to the Design Phase Codes. EC was concerned by the apparent discrepancy between the OH statement that the design would be "consistent with the Codes" and the fact that the EA makes a number of statements which are directly in conflict with Code recommendations. EC in their review, included detailed assessments of inconsistencies and omissions by OH with respect to fourteen (14) applicable Design Phase Code recommendations.

OH The Codes are recognized in the EA both generally (Section 2.5.1) and specifically (Sections 3.2.3.3, 6.1.2.3, 6.1.2.4 and Appendix E).

The draft Construction Phase Code was issued in January 1988 after the EA had been completed. This will be considered at the PIR stage.

With respect to closed water loop, if it is practicable, OH would operate a disposable by-product, limestone slurry process closed loop. If it is not practicable, or in the event OH produces commercial grade gypsum, and a wastewater stream is required, we do not feel that the additional expense to evaporate this stream, compared to the cost of the proposed wastewater treatment process, has been justified considering that the treated wastewater would meet applicable criteria. We do understand that this will be reviewed at the time of licensing under various pieces of legislation (e.g., EP Act, MISA).

OH will involve EC in the PIR process to ensure that the detailed design is carried out in a manner consistent with specific recommendations of these Codes. Notification is mandatory.

EC EC responded that studies which they have sponsored had concluded that closed loop FGD was technically and economically feasible for all FGD systems.

1.6 By-Product Utilization

EC Ontario Hydro has not made a balanced and detailed assessment of the FGD gypsum utilization option. The economics are obviously attractive in many cases, even without considering the non-monetary value of not disposing of large volumes of wastes.

OH The economics of FGD gypsum production are site-specific and are not obviously attractive. A detailed assessment of FGD gypsum production is underway and is scheduled for completion (in fall 1988) before the process and site recommendation is finalized for OH's first FGD installation. These studies will examine economics, including avoided disposal costs (and impacts). EC will have the opportunity to review this study as part of the PIR process.

1.7 Flue Gas Reheat

EC EC questioned OH's conclusion that reheating is not an "economical approach" and consequently OH will not prevent potential off-site effects associated with wet plumes. EC felt that provision for reheat should be made, even if it is only used intermittently during adverse meteorological conditions.

OH OH feels that the proposed low velocity wet stack with nozzles is preferable to using reheat and will not contribute to unacceptable off-site effects.

OH agreed to take another look at the reheat issue as part of its detailed design studies at the PIR stage.

1.8 Continuous Emission Monitoring

EC In-stack monitoring should be provided for measuring sulphur dioxide, nitrogen oxides and opacity.

OH OH recognizes the advantages of in-stack monitoring and that they will likely be required as conditions of approval for permits to operate FGD units. OH is prepared to install these monitors.

1.9 Nitrogen Oxides and Trace Elements

EC It was noted that the recent NOx Protocol may impact on OH's future acid gas control efforts. OH was also referred to a recent IEA paper relating to coal trace elements removal by various FGD systems.

OH NOx emissions are covered by the existing regulation but are not part of this undertaking (see description of Purpose-Section 2.1). OH is involved in some activities to reduce NOx emissions (e.g., low NOx burners) and recognizes it may have to pursue a more vigorous program if new regulatory initiatives are put in-place.

Trace elements are dealt with in the EA (Table 6-14, 6-21 and 6-27) but their removal by FGD is conservatively assumed to be zero - and air quality criteria are met.

1.10 Fugitive Dust

EC Commitment to and methods of dust control are not well detailed in the EA.

OH Methods of dust control are outlined in Table 6-6. Recognition of potential dust problems is made in the EA and commitment is made to further research and site studies to ensure compliance with standards. Commitment to specific mitigation measures will be critical at the PIR stage.

1.11 General Remarks

EC It was noted that over 200 utility FGD systems existed in the world, and that OH has an opportunity to install and operate an exemplary system in terms of environmental protection practices and to show world leadership in FGD system selection, design, operation and decommissioning.

For example, a "zero waste" FGD system was certainly feasible today. The production of commercial by-product gypsum, rather than large amounts of waste, was technically proven, economically promising and environmentally preferable. The prevention of any FGD process aqueous discharges was technically feasible and also environmentally preferable.

1.12 Conclusions and Recommendations

EC Specifically, environmental concerns can be reduced or eliminated by:

(i) having a FGD Program consistent with Codes of Practice;

(ii) considering environmental and other factors in a balanced commercial gypsum study;

(iii) providing flue gas reheat for wet FGD systems;

(iv) providing continuous stack emission monitors;

(v) anticipating future water and air quality requirements; and

(vi) providing detail and commitment to fugitive dust control.

OH Response

(i) See 1.4 above - consistency committed in EA and will be assured through EC involvement in PIR stage.

(ii) See 1.6 above - OH doing a balanced study and EC will have opportunity to review.

(iii) See 1.7 above - OH will review reheat during PIR studies.

(iv) See 1.8 above - OH will install monitors as required by MOE.

(v) Future regulatory requirements are recognized in the EA. The design, construction, operation and decommissioning of FGD systems will have to meet all regulatory standards in-place at the time of installation and throughout their total life.

(vi) See 1.10 above - appropriate control measures will be developed at the PIR stage. Current efforts are being made to remedy the existing problems.

ADDENDUM TO EA

OH does not intend to issue an addendum to the EA at this time. An addendum would have to go through the whole government review process again, and would significantly delay preparation of the Blue Book Review.

Prepared and Approved by:

W.M. Paterson
FGD EA Co-ordinator
Environmental Studies and
Assessments Department
Ontario Hydro

Approved by:

S. Llewellyn
Environment Canada
Chairman - Regional Steering and Coordinating Committee

cc W. Green MOE
S. Llewellyn Environment Canada

700 University Avenue, Toronto, Ontario M5G 1X6

962-FGD-00540-T3

August 26, 1988

Mr. Mark Krasnick
Executive Director
Ontario Native Affairs Directorate
18 King Street East, 3rd Floor
Toronto, Ontario
M5C 1C5

Dear Mr. Krasnick

Thank you for your comments on Ontario Hydro's Flue Gas Desulphurization Environmental Assessment. Initial studies indicate that there are sufficient trade union members within commuting distance of each of the three proposed construction sites to meet our anticipated needs.

As discussed in the EA, under terms of the Electric Power System Construction Association agreement, all construction workers on site will be union members and workers will be provided by the trade union from the union hiring halls. Native people registered with those unions will have the opportunity to work on the project.

Ontario Hydro has a strategy and program, which will be implemented at the FGD sites, which provides the opportunity for local and Native persons to be considered for employment opportunities during construction and operations phase. The applicable principles are:

1. Ontario Hydro will negotiate greater local employment opportunities with the union within the EPSCA agreement where possible.

2. For jobs not covered by EPSCA, Ontario Hydro will attempt to hire Native people in the same proportion as their representation in the local population.

3. Ontario Hydro will discuss with Trade Unions to encourage apprenticeship of Native people.

4. Ontario Hydro will identify and actively encourage local businesses and Indian Bands to bid on service and supply contracts and, where appropriate, Native participation clauses will be included in the invitation to bid documents.

During the Project Implementation Process, Ontario Hydro will continue to provide public information and discuss site-specific concerns with interested groups. The Bands, which you have identified, will be invited to participate in this consultation process.

Sincerely,

G. Ezers, P.Eng.
Senior Project Engineer
FGD Program - GEM
H15 F01

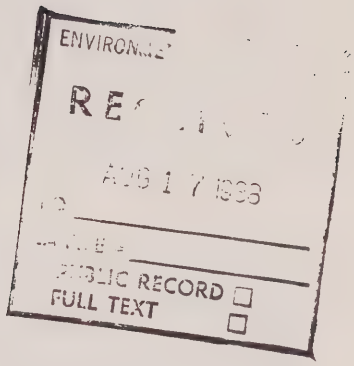
cc W. Green MOE

ontario hydro

700 University Avenue, Toronto, Ontario M5G 1X6

Telephone 592-4071

May 16, 1988



Mr. R. D. Lane
Regional Manager
Airports Authority Group
Transport Canada
4900 Yonge Street
Suite 300
Willowdale, Ontario
M2N 6A5

Dear Mr. Lane:

Reference: 962-FGD-07700-T3
Environmental Assessment
Flue Gas Desulphurization Program

Thank you for your review of the above noted document and your recommendations for marking and lighting of potential new chimneys. Should a system which requires new stacks be installed at any of the candidate stations, Ontario Hydro will ensure compliance with all pertinent legislation, including the Aeronautics Act, as indicated in Appendix E of our FGD EA document. These considerations will be incorporated at the time of stack design.

With regard to your more general comments, monitoring of potential environmental effects will be a significant aspect of the approvals, permitting and licensing phase of the project, when a site, technology and design have been identified.

Again, thank you for participating in the review of the Flue Gas Desulphurization Environmental Assessment. Please contact me if your have any questions.

Sincerely,

R.J. Malvern, P. Eng.
Section Head
Environmental Planning & Assessments
Environmental Studies and Assessments Dept.

DB:cm

c.c. W. Green MOE
b.c.c. G. Ezers H18 A15

b. circ. W.M. Paterson/E.M. Laratta/D.E. Baker/R.J. Malvern

ontario hydro

700 University Avenue, Toronto, Ontario M5G 1X6

July 24, 1988

962-FGD-00540 T3

Mr. W. Green
Environmental Assessment Branch
Ministry of the Environment
7th. Floor
135 St. Clair Avenue West
TORONTO, Ontario
M4V 1P5

Dear Mr. Green:

Ontario Hydro's FGD EA (OH-GE-02) - Post-Submission Discussions with Reviewers

Attached for your information is a chronology and supporting documentation of Ontario Hydro's discussions with technical reviewers of the FGD EA which have taken place since EA submission in February, 1988.

Over the past 5 months, Ontario Hydro staff have met with all reviewers who expressed concerns or required clarification regarding our EA submission in an attempt to resolve outstanding issues. Minutes of meetings, supplemental information and relevant correspondence have been included as attachments to this letter.

A summary of these discussions is provided below;

1. MOE APPROVALS BRANCH

Several meetings were held with Approvals Branch staff to review in detail their comments on the FGD EA. Requests for supplemental information were made and this information was supplied to MOE in June and July, 1988. Much of the concern expressed by MOE appears to be related to a desire to see more design detail and mitigation commitment in the EA. Recognition of future regulatory changes (ie., CAP and MISA) and FGD process selection criteria were also raised as issues.

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Regarding MOE's first concern, it is Ontario Hydro's position that the Project Implementation Process (PIP) outlined in the FGD EA provides a mechanism for detailed review by MOE and others of each FGD project prior to installation. The PIP is an integral and **mandatory** part of the EA process defined for the FGD Program. Required post-EA Act licensing and approvals under relevant environmental and other legislation (eg., Environmental Protection Act) provides a subsequent review mechanism to ensure FGD system components are designed and operated to meet MOE requirements. Early discussions between Hydro and MOE recognized that the FGD EA would be a generic type document with a provision for dealing with project details in a Project Implementation Report.

With respect to evolving regulatory changes it is Ontario Hydro's intent to design and operate any installed FGD systems to meet the "law of the land" in-place throughout the life of scrubber operation.

As far as FGD process selection criteria are concerned, it is important to note that Hydro is not seeking to eliminate any FGD processes from consideration. The candidate processes initially selected and discussed in the EA are those that Hydro feels are commercially developed and/or suit our needs at this point in time. MOE's acid gas regulation for Ontario Hydro does not specify how Hydro is to reduce its emissions. The decision is left to Hydro to decide on a cost-effective and environmentally acceptable control program. Flexibility to utilize other processes in the future does exist via the Amendment process outlined in the FGD EA (Chapter 9).

2. ENVIRONMENT CANADA

Environment Canada's concerns centred mainly on the lack of commitment to specific mitigation measures in the FGD EA. Perceived inconsistency with their Design Phase Environmental Codes of Practice for Steam Electric Power Generation was a particularly critical concern. They also expressed the view that Ontario Hydro should show leadership in designing and operating a zero discharge FGD system.

As noted above, the FGD EA is by agreement a generic program-type document which demonstrates the environmental acceptability of installing a number of candidate FGD processes at a number of Ontario Hydro coal-fired generating stations. As such, ranges of process designs, impacts and mitigation are discussed. Detailed design and site-specific mitigation will be developed at the PIP stage. Environment Canada and others will be involved in the PIP.

.../3

In the FGD EA (Section 2.5), Ontario Hydro commits to "ensure consistency" with Environment Canada's Codes of Practice. Specific application of their Design Phase Codes are more appropriately discussed at this later stage, once a FGD process and candidate site have been selected for initial installation. Flexibility still exists to ensure consistency with the Codes of Practice.

It may in fact be possible to develop a zero discharge FGD system. With respect to water balance, if it is practicable, Hydro will operate a disposable by-product limestone slurry process closed loop. If it is not practicable, or in the event Hydro produces commercial grade gypsum, and a wastewater stream may be required. We have proposed to treat any wastewater stream to meet applicable Provincial criteria. Evaporation of this stream would likely be prohibitively expnesive. This aspect will be reviewed in detail during the PIP and at the time of licensing under various pieces of Provincial legislation (eg., EP Act - MISA).

Production of commercial gypsum is being considered by Ontario Hydro. Studies are underway to look at the site-specific economics, technical considerations and avoided disposal costs at Nanticoke and Lambton GS. The results of these studies will be available before and considered when Hydro makes its recommendation of site and process for the first FGD installation. In developing the technical specification for the first limestone slurry FGD units, Hydro is currently planning to tender processes that are capable of producing commercial grade gypsum. Commitment to produce a commercial grade product will be contingent on the results of studies and successful negotiation with a potential user.

3. ONTARIO MINISTRY of AGRICULTURE and FOOD (OMAF)

OMAF's concerns related mainly to waste management. In particular, they were concerned about loss of agricultural land for landfilling purposes as well as waste site rehabilitation.

It was made clear that Hydro views landfill as a necessary worst case, contingency to ensure reliable operation of its FGD systems. Opportunities to utilize FGD by-products for constructive purposes (eg., gypsum, mine backfill) do exist for the candidate processes being considered, and are being assessed - but will require additional study and negotiation with potential uses before a firm committment can be made. This type of detailed design consideration and negotiation will be dealt with during PIP for each committed FGD project.

Detailed waste site development and rehabilitation considerations will also be dealt with at the PIP stage. OMAF will be invited to participate in these PIP studies.

.../4

4. MUNICIPALITIES

We have held discussions with Planning Committees and/or staff level representatives at each of the candidate sites (Lambton, Lakeview and Nanticoke). Municipal staff at each site seem to have a very good grasp of the FGD EA process and understand that their involvement will be mainly in the PIP. Concerns relate mainly to traffic and waste management aspects of the projects.

I trust this information will assist you in finalizing your review of the FGD EA. If you require any additional information or clarification, please give Diane Barker (592-8195) or myself (592-6007) a call.

Yours truly,

W.M. Paterson
FGD EA Coordinator
Environmental Studies & Assessments Department

Attachment

ENVIRONMENTAL ASSESSMENT - ONTARIO HYDRO'S FGD PROGRAM

POST FGD EA SUBMISSION - CHRONOLOGY

FGD EA submitted (Distributed List Attached)	February 12, 1988
Gov't Review Comments Received	April 20, 1988
Meetings with Reviewers	See Below

Date	Agency/Group Met With	Documentation
April 12, 1988	Regional Municipality of Haldimand-Norfolk Planning & Economic Development Committee Meeting	Letters (A#1)
April 28, 1988	Energy Probe	
May 18, 1988	OMAF	Minutes (A#2)
May 25, 1988	MOE Technical Reviewers	Minutes & Supplemental Info (A#3&#4)
June 8, 1988	Environment Canada	Minutes (A#5)
June 9, 1988	Regional Municipality of Haldimand-Norfolk	Event Summary Report (A#6) & Letter (A#7)
June 15, 1988	MOE - Land Use Planning Unit	Minutes (A#8)
June 21, 1988	City of Nanticoke - Tour of Nanticoke GS	Event Summary Report (A#9)
June 23, 1988	Township of Moore	Letter (A#11)
June 23, 1988	Regional Municipality of Peel and City of Mississauga	Event Summary Report (A#10)
June 27, 1988	MOE Approvals Branch	Revised Minutes (A#3)
July 20, 1988	MOE Approvals Branch	Supplemental Info (A#4) supplied

"A" = Attachment

ontario hydro

700 University Avenue, Toronto, Ontario M5G 1X6

962-FGD-00541-T3

August 17, 1988

Mr. Wes Green
Planner
Environmental Assessment Branch
Ontario Ministry of the Environment
135 St. Clair Avenue West
Toronto, Ontario
M4V 1P5

Dear Mr. Green:

Re: Ontario Hydro's Flue Gas Desulphurization Environmental Assessment

I appreciate your continued participation in the presubmission consultation and review of Ontario Hydro's Flue Gas Desulphurization Environmental Assessment. Regarding your most recent comments, as discussed in a meeting on August 16, 1988, Ontario Hydro will consult with you and make revisions to Figure 8-1, Project Implementation Process, as required to ensure that the process is clearly explained.

I look forward to a favourable review of the Environmental Assessment.

Sincerely,

W.M. Paterson
FGD EA Co-ordinator
Environmental Planning & Assessments
Environmental Studies & Assessments Department

ontario hydro

700 University Avenue, Toronto, Ontario M5G 1X6

962-FGD-05420-T3

August 26, 1988

Mr. Wes Green
Environmental Assessment Branch
Ontario Ministry of the Environment
135 St. Clair Avenue West
7th Floor
Toronto, Ontario
M4V 1P5

Dear Mr. Green

Ontario Hydro's FGD EA--Post-Submission Discussion

With regard to your interest in the environmental effects of alternatives to the undertaking, Ontario Hydro notes the following. Chapter 3 of the Environmental Assessment outlines a number of alternatives for reducing acid gas emissions. These alternatives are not mutually exclusive; they all form a part of Ontario Hydro's plan to reduce acid gas emissions. Ontario Hydro has or will install them as required by economics and supply/demand forecasts for the reasons detailed for each in Chapter 3 of the EA document. Several of the alternatives are already being used to varying degrees because they are required and are available for immediate use. FGD, on the other hand, requires approval under the Environmental Assessment Act before it becomes available as an acid gas emission control option.

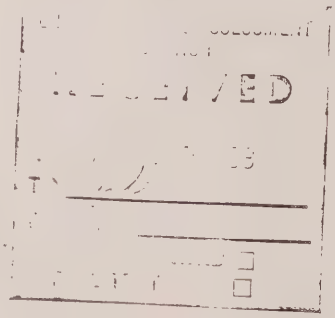
In the context of Ontario Hydro's Flue Gas Desulphurization Program the currently approved or available alternatives have no incremental environmental effects. Some alternatives, such as clean coal technology and new generation facilities, will have environmental effects but these alternatives are not available within the required time-frame and therefore are not feasible alternatives for the reasons detailed in Chapter 3 of the Environmental Assessment.

Sincerely

for W.M. Paterson
FGD EA Co-ordinator
Environmental Planning & Assessments
Environmental Studies & Assessments
H10 G03

bcc G. Ezers H15 F01

bcirc R.J. Malvern/D.E. Barker/W.M. Paterson



APPENDIX C

PROPONENT'S SUMMARY OF THE ENVIRONMENTAL ASSESSMENT

Summary

10.0 SUMMARY

10.1 The Undertaking

The undertaking, as described in this EA, is a program of activities to retrofit flue gas desulphurization (FGD) facilities at selected Ontario Hydro coal-fired generating stations. Ontario Hydro is seeking approval for all activities relating to the design, construction, operation and maintenance and decommissioning of up to twenty FGD units, including associated waste disposal facilities and any required property acquisition.

Approval is requested initially to install FGD units, using up to four different technologies located at Ontario Hydro's Lambton, Nanticoke and/or Lakeview Generating Stations. Candidate FGD technologies include: wet limestone slurry, limestone dual alkali, lime spray dryer and sorbent furnace injection.

Approval is also requested for a procedure to implement projects (i.e. a specified FGD technology at each candidate site) under the FGD Program, as well as an amendment procedure to allow future incorporation of additional generating station sites and/or new FGD processes.

The purpose of the undertaking is to reduce Ontario Hydro's sulphur dioxide (SO_2) emissions from its operating coal-fired generating stations to levels required by O. Reg. 281/87 under the Environmental Protection Act. The regulation requires Ontario Hydro to reduce its acid gas emissions by about 60 percent, from its 1981 annual emission rate of 490 tonnes, by 1994.

Ontario Hydro requires the flexibility to operate existing coal-fired stations for a range of future circumstances to produce electricity both economically and reliably, while still meeting the acid gas control regulation. Approval of the undertaking will make FGD available as an option in Ontario Hydro's Acid Gas Emission Control Program.

Under 1987 planning assumptions, (load growth rate of 2.4 percent/annum), eight 500 MW coal-fired generating units or their equivalent may need to be retrofitted with FGD between 1994 and about 2000. EA Act approval is required by July, 1989, to allow sufficient time to have the first FGD units in-service by 1994.

10.2 Alternatives

10.2.1 Alternatives to FGD

Ontario Hydro's approach to controlling its acid gas emissions over the long-term is to develop options and put in place the most appropriate ones, as and when required. Options being developed for controlling acid gas emissions can be divided into four broad categories: reduce coal use, reduce the sulphur content in fuel, develop clean coal combustion technologies and install emission control technology (i.e. FGD). These control options are not mutually exclusive and are all candidates for Ontario Hydro's program to reduce acid gas emissions. Current system plans propose using a combination of these options for meeting future electricity needs while staying within prescribed emission limits. Current planning (Ontario Hydro, 1987a) indicates there is a need to have FGD as an approved component of Ontario Hydro's Acid Gas Control Program.

Many of the alternatives available for reducing coal use have lead-times that largely exclude their use in the mid to late 1990's. Alternatives such as hydroelectric and nuclear are already base loaded, and in the short term, there is no scope to increase their energy production. Measures to reduce sulphur levels in fuels are limited by both the cost of cleaner fuel and the cost of required station modifications. Clean coal technologies have not been commercially proven at large enough scales to warrant widespread commitment now. Finally, with the do nothing alternative there is a high probability that Ontario Hydro cannot meet future electricity demand without exceeding the acid gas regulation.

10.2.2 Alternative Methods of Carrying Out the Undertaking

10.2.2.1 Candidate GS Sites

The three candidate stations (i.e. Lambton, Lakeview and Nanticoke GS) have a combined installed capacity of 8400 MW or 93 percent of Ontario Hydro's total operating coal-fired generation. All three stations are major contributors to acid gas emissions in Ontario, and are designed to burn medium sulphur, U.S. coals.

Lambton and Nanticoke GS's are expected to operate at fairly high annual capacity factors (ACF's) in the mid to late 1990's. Lakeview is utilized less extensively at present but its use is also expected to increase in the mid to late 1990's. The pattern of future use of these stations will be strongly dictated by load growth and other system developments.

10.2.2.2 Candidate FGD Technologies

Of primary concern to Ontario Hydro in selecting candidate FGD processes is a requirement that they be reliable, cost-effective and environmentally acceptable. Primary criteria used during the preliminary screening of FGD technologies were status of development and economics. Only processes which have been demonstrated at commercial scale or have achieved acceptable test results under utility conditions similar to Ontario Hydro's were considered for proposed application at the candidate sites. The flexibility provided by the FGD EA approval will allow insertion of new technologies into the overall FGD Program (Chapter 9).

All four candidate FGD processes produce non-hazardous, disposable by-products that can be effectively managed using conventional landfilling techniques. FGD processes producing a disposable by-product currently represent about 94 percent of the total installed scrubber capacity of about 53,000 MW in the U.S.

Some FGD processes operating in the U.S. produce a saleable by-product. These processes represent only approximately six percent or about 3300 MW of the FGD capacity installed in the U.S. utility industry. In general, these systems are more complex, more energy intensive and more expensive to build and operate than disposable by-product systems. Generally, the by-product credit for sulphur or sulphuric acid does not compensate for the additional capital charges and operating costs associated with these systems.

Currently, candidate FGD technologies include:

(a) The **limestone slurry process** is the most widely applied FGD process. The lime slurry process is a very similar process. Together these processes represent approximately 80 percent of the installed capacity. The limestone slurry process is often considered the standard of comparison for new competing technologies; technically and economically. A variation of this process can produce wallboard quality gypsum.

The economics of gypsum production are very site-specific, and this option will be considered in process selection studies for each candidate GS site.

(b) The **lime spray dryer process** is a more recent development which is finding growing acceptance. All of the utility applications to date have been on low sulphur coal where the economic advantage relative to the lime or limestone slurry process is greatest. However, the process has been tested in a short-term demonstration program on a utility boiler burning high sulphur coal and studies have concluded it can be competitive in cost with the limestone slurry process on higher sulphur coals. This process largely eliminates problems of component erosion, plugging, water balance and reliability.

(c) **Dual alkali process** applications in the U.S. are all operating on high sulphur coal and were designed to use lime rather than limestone for regeneration. Limestone regeneration is being developed because of the high cost of lime. The dual alkali process eliminates plugging and erosion problems associated with the limestone slurry process by scrubbing with a clear solution rather than a slurry, and may also offer a capital cost advantage.

(d) **Sorbent furnace injection** is a low capital cost, low removal efficiency process but can be installed in less time than the high efficiency processes. Ontario Hydro has achieved encouraging results from its research and development test facility at Lakeview GS.

10.2.2.3 Waste Management

Given the increase in waste quantities that will be generated through the addition of FGD at the three candidate sites, available on-site disposal areas will not be adequate to deal with life cycle wastes, regardless of the disposal method chosen. This situation is particularly critical at Lakeview where no on-site storage is available and existing quantities of ash must already be marketed and/or disposed of off-site.

There are essentially two ways to deal with anticipated waste disposal problems at the three candidate sites: either find additional waste disposal space or find a market for the waste to reduce or eliminate the need for additional disposal areas. Waste utilization (marketing) options do not appear to offer the required market potential, or have enough commitment now, to be relied on as a primary method for managing lifetime FGD wastes.

At present, disposal on property contiguous to Lambton and Nanticoke appears to offer the best practical solution to long term FGD waste management. An evaluation of alternative remote disposal sites at Lambton and Nanticoke has confirmed the acceptability of using adjacent properties for waste disposal. Disposal of Lakeview wastes can be accommodated at Nanticoke on an interim basis, but a study is being conducted in parallel with the FGD EA to find a more suitable alternative. A site is expected to be approved and available by 1992.

Over the long term, Ontario Hydro will be investigating opportunities to make constructive use of these by-product materials as a means of reducing lifetime FGD waste disposal requirements.

10.3 Existing Environment and Proposed FGD Facilities

All three candidate sites are located in recognized industrial areas where there has already been a noticeable effect on land use and environmental quality. The proposed station modifications are not likely to cause any conflict with intended long-term land use, or contribute to any significant incremental adverse environmental effects.

At each of the candidate generating stations, space is available within the existing plant site boundaries to accommodate all the necessary FGD equipment, including waste processing, but not for ultimate waste disposal. At Lambton GS and Nanticoke GS, some on-site space and adjacent properties are available and technically suitable for waste disposal. Lakeview GS waste may have to be transported to Nanticoke on an interim basis.

10.4 Environmental Effects and Mitigation

Although the technologies being installed will be the first in Canada, many scrubbers are already in-place in the United States and other countries.

10.4.1 Construction

Installation of FGD facilities at each of the three candidate generating stations will be comparable to any large-scale construction project. It will involve mobilization of equipment and manpower, site preparation, equipment fabrication and installation, building of structures, equipment operation/maintenance and site landscaping/restoration.

The construction methods will be standard to any project of similar magnitude. As such, the effects associated with the construction aspect of the project are generally predictable, and will be similar to, though of much lesser magnitude than, those encountered during construction of the original stations. Retrofit installation may face problems of fitting in large equipment amongst existing station facilities.

Potential concerns and the expected degree of effect associated with the installation of FGD equipment and related facilities are listed in Table 10-1. Detailed discussion of site-specific effects and mitigation is provided earlier in Chapter 6. Construction effects will have a finite duration, between two and a half and four years, depending on the process selected. Potential impacts will be similar for construction of any of the processes. Effects associated with FGD equipment installation will largely be confined to areas within existing site boundaries for the three generating stations. Most of these effects can be minimized by employing sound, environmentally acceptable construction practices.

The displacement of selected off-site land areas for waste disposal is the only significant negative effect associated with the FGD construction phase. Over 400 ha of off-site storage space may be needed to accommodate lifetime FGD wastes from the three candidate generating stations. Up to 133 ha, 220 ha and 72 ha will be required to store lifetime FGD wastes produced at Lambton, Nanticoke and Lakeview Generating Stations, respectively. The land proposed to be displaced at Lambton GS is zoned industrial. Approximately half of this land is now used for agriculture. At Nanticoke GS, the land proposed for waste disposal is zoned for both industrial and agricultural use, but is all contained within the Nanticoke Industrial Influence Area. The majority of this land is presently used for agriculture. There is no on-site or adjacent property available for waste disposal at Lakeview GS. Therefore, Lakeview wastes may have to be transported to the existing Nanticoke waste disposal area on interim basis until a new disposal site is available.

The land displacement effect will be most disruptive and immediate in the case of wet gypsum stacking since a large area will have to be completely cleared during the construction phase to allow for development of diking and other structures. This approach will allow for optimal operation of a gypsum stacking technique. Other disposal techniques will displace land in a more gradual fashion because they can be developed in a modular or staged manner. Land not being used immediately for waste disposal could be leased for agricultural or other purposes.

Improved employment opportunities and contribution to the local economy are significant positive effects which will result from the construction of FGD facilities.

10.4.2 Operation

Potential effects resulting from the operation of the installed FGD facilities are largely dependent upon the process selected. Table 10-1 summarizes the type and extent of environmental effects likely to be associated with the operation of FGD systems. The

TABLE 10-1
Potential Effects Associated with FGD Construction, Operation and Waste Disposal

(a) Construction

POTENTIAL CONCERN		RELATIVE EXPECTED DEGREE OF EFFECT				
		Significant Negative	Minor Negative	No Effect	Minor Positive	Significant Positive
ATMOSPHERIC:	Dust		●			
	Noise		●			
	Emissions		●			
AQUATIC:	Surface Water			●		
	Ground Water		●			
TERRESTRIAL:	Unusual Species		●			
	Habitat			●		
	Land Use	●				
SOCIO-ECONOMIC:	Traffic		●			
	Employment					●
	Accommodation				●	
	Agricultural Industry		●			
	Local Economy					●
	Heritage			●		
	Recreation/Tourism			●		

(b) Plant Operation

POTENTIAL CONCERN		RELATIVE EXPECTED DEGREE OF EFFECT				
		Significant Negative	Minor Negative	No Effect	Minor Positive	Significant Positive
ATMOSPHERIC:	Dust		●			
	Noise		●			
	Emissions					●
	Plume Visibility		●			
AQUATIC:	Surface Water			●		
	Ground Water			●		
	Water Consumption		●			
TERRESTRIAL:	Unusual Species			●		
	Habitat			●		
	Land Use			●		
SOCIO-ECONOMIC:	Traffic		●			
	Employment				●	
	Accommodation			●		
	Agricultural Industry			●		
	Local Economy				●	
	Heritage			●		
	Recreation/Tourism			●		

(c) Waste Site Operation

POTENTIAL CONCERN		RELATIVE EXPECTED DEGREE OF EFFECT				
		Significant Negative	Minor Negative	No Effect	Minor Positive	Significant Positive
ATMOSPHERIC:	Dust		●			
	Noise		●			
	Emissions			●		
	Plume Visibility			●		
AQUATIC:	Surface Water		●			
	Ground Water		●			
	Water Consumption			●		
TERRESTRIAL:	Unusual Species			●		
	Habitat			●		
	Land Use		●			
SOCIO-ECONOMIC:	Traffic		●			
	Employment				●	
	Accommodation			●		
	Agricultural Industry		●			
	Local Economy				●	
	Heritage			●		
	Recreation/Tourism			●		

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expected degree of effect for each of the concerns is based on worst case situations from among the four candidate FGD technologies selected for retrofit at Ontario Hydro's three stations. A worst case for all concerns will not result from the installation of any one candidate technology; that is, each technology has its own set of environmental advantages and disadvantages (as outlined in Chapter 4). On balance, it would appear that wet processes, particularly wet limestone slurry, seem to have more potential for environmental effects than do dry FGD processes; and may require considerably greater mitigative action to ensure compliance with regulatory standards. It should be noted, however, that due to the extensive operating experience related to wet scrubbers, many of the potential problems have been addressed and effectively dealt with via design improvements and operational modifications.

Potential effects related to FGD operation will result from two main areas: the FGD or scrubber plant itself and the operation of the waste disposal facility.

Effects associated with the plant can be compared to those resulting from a large manufacturing operation: raw material (reagent) delivery, receiving and preparation, processing (sulphur dioxide removal), product (waste) development, processing and removal. No significant negative effects are expected to result from operation of the FGD plant itself. With wet systems, there may be a need to blow down liquid effluent from the system to maintain optimal operating conditions within the scrubbing process. There will be an overall improvement in the quality of the atmospheric emissions from the station, although there may be some increases in plume visibility associated with operation of a wet system. Increases in plume visibility may result in more frequent complaints regarding station operation. Dust from reagent and waste disposal areas will contribute to an increase in ambient dustfall levels but any exceedances will generally be restricted to within 300 metres of the station property boundaries. These dustfall levels will be mitigated during operation through the use of appropriate control measures, and will be reduced over the long term by using proper waste site rehabilitation techniques.

Waste management will be an important concern when operating any disposable by-product FGD systems. Waste volumes resulting from retrofitting FGD at the three stations will increase by about three times over quantities currently being produced (i.e. primarily ash) using conventional, unscrubbed coal-fired units. Wastes produced are characterized as non-hazardous in relation to existing regulatory standards and can be managed using a variety of wet and dry techniques. The type of waste management system selected will be dictated by its parent FGD process.

Concerns related to waste site development and operation will be similar to those associated with conventional landfilling practices. Use of contiguous property for landfilling or stacking will minimize the potential for adverse effects on neighboring communities by eliminating the need for off-site waste transport. In some instances, it may be necessary to relocate certain existing facilities to accommodate development of new waste disposal sites. Proper site development and management procedures will be required to minimize dust problems associated with landfilling. Site landscaping and contouring will be important in minimizing adverse aesthetic impacts resulting from creation of sizeable waste mounds.

In disposing of FGD wastes, leachate can result from water used for waste transport, process water occluded in the waste or as a result of precipitation permeating the waste material. Leachate from the waste has the potential for entering and affecting the dissolved solids loadings (i.e. sulphates, chlorides) in local surface and ground water resources. Studies have shown that any trace elements in these wastes are relatively immobile, and will remain directly beneath the waste site. Disposal of FGD wastes using wet gypsum stacking involves creation of a large standing head of process water, and probably presents the worst case from among all FGD waste management techniques currently being considered by Ontario Hydro.

Preliminary hydrogeological investigations at Nanticoke GS suggest that soil conditions at some locations are such that an impervious clay liner will have to be considered. At Lambton GS, the presence of a 45 metre thick clay deposit will significantly limit leachate migration potential.

Over the remaining service life of the candidate generating stations, some employment opportunities and improved local economic conditions will result from operation of the FGD facilities.

10.4.3 Waste Site Rehabilitation

Any waste disposal sites will be rehabilitated modularly as areas are retired from active landfilling use. Rehabilitation will initially take the form of covering the waste with a clay cap and promoting revegetation. Proper rehabilitation should improve the long term aesthetics of the area and have environmental benefits such as dust control and a reduction in the potential for surface and ground water contamination in the post-closure phase.

Ultimately, when the station is retired, the waste disposal area should be suitable for use as a residential or light industrial area, recreational development or agriculture. Municipalities will be consulted in determining end uses and suitable rehabilitation measures.

10.5 Public and Government Involvement

The public involvement component for the FGD Program was designed to provide local municipalities and the public an opportunity to learn about Ontario Hydro's Acid Gas Control Program, the FGD program, to review information and to provide comments. Provincial groups having an interest in the acid rain issue were also invited to participate. A Backgrounder, workshop, public information centres, presentations and meetings with municipalities were the main components of the program.

In general, municipalities and the public were supportive of Ontario Hydro's intention to install FGD equipment, however, local adjacent landowners were concerned about the potential adverse effects associated with waste disposal (i.e. dust, noise, location, land values).

Representatives from a number of government agencies (mainly MOE) were involved in pre-submission consultation (PSC) with Ontario Hydro. Discussions were held to ensure that the FGD EA document met requirements of the EA Act and that the technical assessment of effects was appropriate. Many of the technical issues identified during PSC will be dealt with in more detail during the project implementation phase for selected FGD technology and site combinations.

There will be opportunities for public and government involvement during the project implementation phase for various FGD units installed at the three candidate sites. Also, opportunities exist for the public and government to review any proposed amendments (e.g., adding a new FGD technology) to the FGD EA. Details of this involvement are discussed in Chapters 8 and 9 respectively.

10.6 Benefits of FGD Retrofit

The retrofit of FGD equipment at candidate Ontario Hydro coal-fired generating stations will have the following benefits:

(a) allow Ontario Hydro to effectively utilize its coal-fired generating stations to provide electricity in a cost-effective and environmentally acceptable manner and under a wide range of circumstances;

(b) a reduction of sulphur dioxide emissions from Ontario Hydro's existing coal-fired generating stations to levels specified in Regulation 281/87;

(c) the creation of a significant number of local construction jobs (i.e.., an average workforce of 200 over a 4 to 5-year period) and increased local spending during the installation of FGD equipment;

(d) the creation of 50 to 120 permanent jobs at each station to support operation and maintenance of the FGD facilities;

(e) the creation of a new market for limestone/lime within the province. While the limestone/lime resource base seems adequate, production levels will likely have to be increased significantly to meet the anticipated demand; and

(f) some improvements in local air quality as well as small reductions in acid deposition in sensitive areas within Ontario and neighbouring regions.

10.7 Unavoidable Effects

As discussed in this assessment, there will be controlled air emissions, liquid effluents and other direct effects associated with the construction, operation and decommissioning of retrofit FGD facilities. However, analysis shows that these effects are generally well within, or can be effectively controlled by practical means to meet regulatory standards and minimize any adverse local concerns.

The cost of the FGD facilities will increase Ontario's electricity rates (1 to 4 percent) by the year 2000 to cover the capital and operating costs of the FGD Program. The actual rate increase will be a function of the number and type of units retrofitted and the timing of their installation. Current planning suggests that up to eight 500 MW units or their equivalent may be needed by the year 2000.

The most significant unavoidable effect associated with FGD retrofit will be the use of selected off-site land areas adjacent to Nanticoke and Lambton Generating Stations for waste disposal purposes. Geotechnical and environmental conditions at the proposed disposal sites are compatible with this use. At Lakeview GS, there will be an effect associated with off-site transportation of waste for proposed disposal at Nanticoke GS or any other remote off-site location.

10.8 Conclusions

Based on this assessment, Ontario Hydro concludes that any of the four candidate FGD systems can be retrofitted in an environmentally acceptable manner at either Lambton, Nanticoke or Lakeview Generating Stations; and that this will be effective in meeting the objective of reducing Ontario Hydro's sulphur dioxide emissions to levels specified in Regulation 281/87.

Development of the FGD option will enable Ontario Hydro to operate its existing coal-fired generating stations over a range of future circumstances to produce electricity economically and reliably, while still meeting the acid gas regulation. The implementation procedure developed as a part of this undertaking will provide opportunities for government and public review of the detailed design of committed FGD projects, and ensure that these projects are installed and operated in an environmentally acceptable fashion. The amendment procedure will allow for future incorporation of new FGD technologies, at these three sites and possibly other Ontario Hydro coal-fired generating stations, as and when they become available.